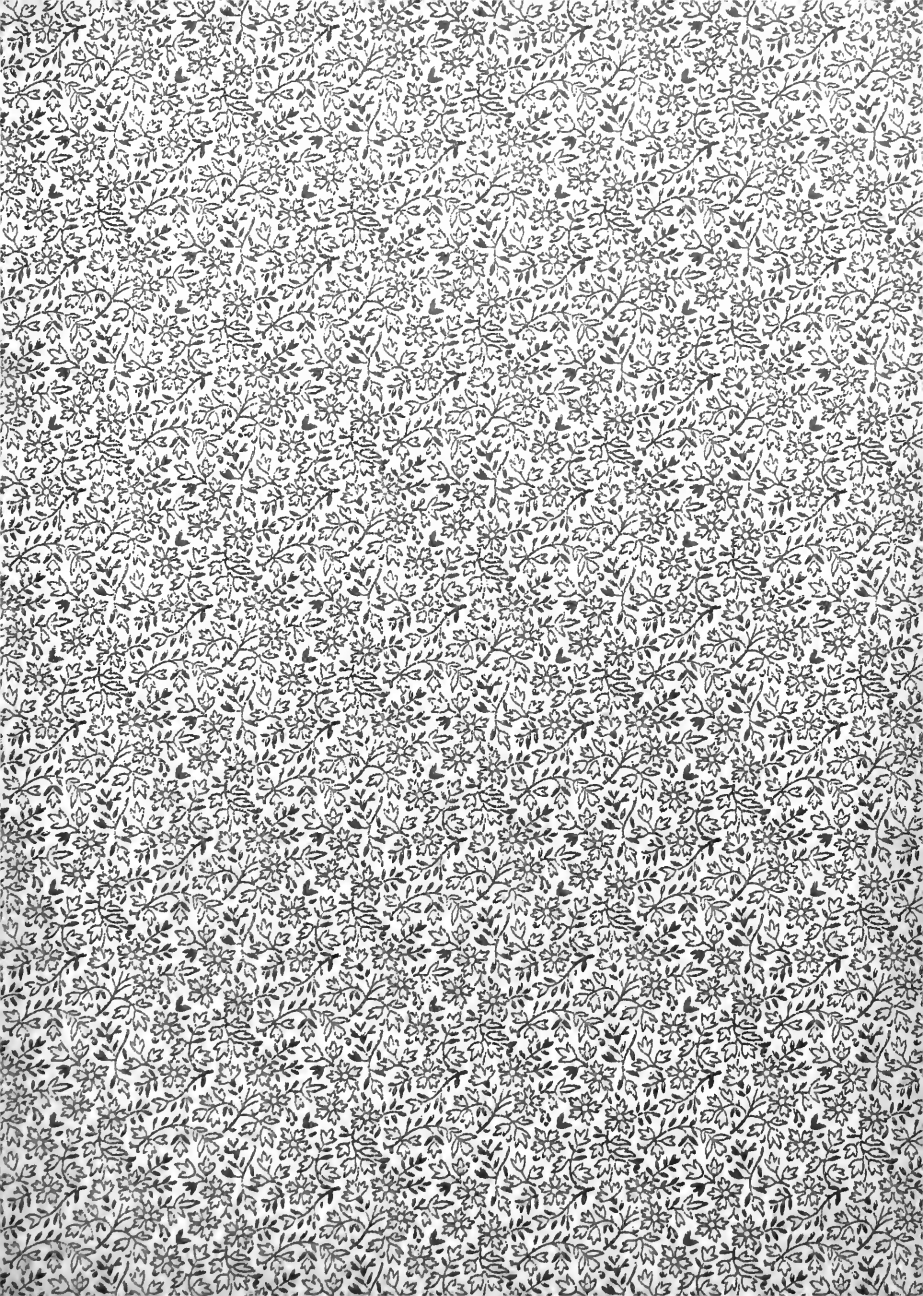
Cholera.

Vol. II.

By Dr. G. Archie Stockwell, F.Z.S.



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CHOLERA,

ITS PROTEAN ASPECTS AND ITS MANAGEMENT.

BY

DR. G. ARCHIE STOCKWELL, F.Z.S.

(Member New Sydenham Society, London.)

IN TWO VOLUMES—VOL. II.

"Respice, aspice, prospice."

1893.

GEORGE S. DAVIS,

DETROIT, MICH.

CHAPTER X.

PAST MANAGEMENT OF CHOLERA.

It certainly is a sad travesty upon therapeutic progress when the members of the profession at large, as voiced by Thos. Hawkes Tanner, and by The Lancet, of London,* is forced to confess "it is folly to talk of curing cholera" since the "very principles which should guide are undetermined;" that "we may be comforted by the better knowledge of the diffusion of the disease, and the better powers of sanitary authorities for resisting it; and the more we study allied diseases, and learn effectually to cope with them, the greater confidence we may feel in contemplating the invasion of a malady *which admits of so little satisfactory treatment*," etc.; that it is "unknown whether ultimate convalescence depends upon a persistence of the intestinal evacuations, or upon their suppression!"

To be sure, patients recover under all forms and methods of treatment, as is universally allowed; but it must be remembered the period, as well as the character and form of the disease, greatly influences the apparent action of medicines; that he who treats disease by *name* only, is utterly unworthy of rank in the medical profession; that in all epidemics a remedy that seems to be of the utmost benefit in one is of no

* August 20th, 1892.

value in another, and in the same epidemic varies according to continuance; and in cholera, as in all diseases of its class, during its onset and *fastigium* as an epidemic the course is marked by the great percentage of fatalities, while with its wane recoveries are the general rule! So, too, the attacks of the disease tend, in the majority of instances, independent of all remedial measures, to improve at certain seasons, or under certain meteorologic, telluric, or atmospheric conditions, and to retrograde at others.

It is a notorious fact that in more than ninety per cent. of cases the drugs which are ingested, or employed in enema, are quickly returned in the vomit or stool, or, failing this, are mingled with the fluids of the *prima viæ* without absorption until the crisis is over, when they are perhaps more apt to prove mischievous than beneficial. The very condition of stomach and bowels evidences their inability to absorb remedies, and the sole chance is, that some, by localized influence upon the nerve fibrillæ terminating in the gastric viscus, may induce through the nervous system a revulsive action.

Prior to the appearance of the present (1892) epidemic, in England and the United States there were few practitioners who did not believe it a duty to attempt to check the so-called premonitory diarrhœa with astringents and opiates; and reports of thousands of cases might be collected where medical men have believed that thereby they prevented the devel-

opment of the stage of collapse, though it is apparent the theory upon which such practice was based is far from infallible. Further, the whole subject has been so complicated by the publication, both in medical journals and in the general press, of immature hypotheses, extravagant conceits, and infallible receipts, and the views held by different individuals (the majority of whom recognize only the effects and ignore the initial lesion) seeing the same class of cases, even in the same institutions, are so opposite and conflicting, it appears difficult to form a trustworthy opinion. These publications not only frequently serve to show the ignorance, weakness, and credulity of the writers, but likewise tend to bring discredit on the medical profession generally. Physicians, only in each succeeding epidemic learn that the lessons they so carefully taught, and the principles that they so sedulously inculcated during the preceding, are possessed of no real value — in reality have a mischievous tendency.*

*But when the regular symptoms peculiar to the severe form of cholera had set in, medicine, I repeat, had very little influence upon it; and accordingly, as might have been expected, a hundred different cures of the disease were announced, most of them all but impossible. Some persons held that timely bleeding would save the patient; others relied confidently upon mustard emetics. Hot air baths were manufactured, and sold to a great extent, to meet the apprehended attack in that manner without delay. Certain practitioners maintained that the disease was to be remedied by

Nearly every article in the materia medica has been tried and received an ephemeral glory of praise: Large doses of calomel, reaching as high as two drachms, while one individual found a perfect panacea in *two ounces;* lupulin in doses of *six pounds* (*!!*) opium, and opiates, still considered the "sheet anchor" by many, though Dr. Norton, of Cincinnati, expresses the opinion, based upon experience, that by the free use of these cholera is apt to take on a typhoid con-

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introducing into the system a large quantity of neutral salts, which were to liquefy and redden the blood, and to restore the functions of the circulation; but of this practice it was said, in a sorry but true jest, that however it might be with pigs or herrings, *salting* a patient in cholera was not always the same thing as *curing* him. In a great number of the sick the blood was mechanically diluted by pouring warm water, or salt and water, into the veins. Some physicians put their trust in brandy, some in opium, some in cajeput oil, which rose to I know not what price in the market; some, again, in calomel alone.

Now I would not willingly mislead or deceive upon this point, by speaking with a confidence which I really have no warrant for, of the success or propriety of any of these expedients. I believe that each in some cases did good, or *seemed* to do so; but I cannot doubt some of them did sometimes also harm. I had not more than six severe cases under my own charge; and I congratulate myself that the mortality among them was not greater than the average mortality. Three died, and three (I will not say they were cured, but) recovered. The three that died I was called in to see when the disorder was at its height; and in each case it went on with frightful rapidity, in spite of all the means adopted, and

dition in its third stage, and Sir Thomas Watson frankly admits many cholera patients have been ushered out of the world thereby; brandy, which while in moderation may act in some measure as a preventive by stimulation of the cardiac and respiratory centres, by prolonged use entails depression and lack of vitality in the same; acetic, muriatic, nitric, sulphuric, fluoric, tannic, gallic, salicylic, carbolic, and lactic acids; oils of cajeput, castor, croton, wintergreen, etc.; creasote; chloroform; sugar; sul-

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proved fatal a few hours afterwards. The three that recovered I saw somewhat earlier, but still not till the specific symptoms were present; one was a girl in the hospital. They all recovered under large and repeated doses of calomel. Yet (as I said before) I do not venture to affirm that the calomel cured them. In the first case that was treated in that way, I merely followed up the plan that had been begun by Dr. Latham, who had visited the patients for me when I was accidentally absent. I found that he had felt better, less sick, and less faint, after taking half a drachm of calomel at a dose; and I repeated the same dose for many times, for after every dose his pulse rose somewhat and he appeared to rally. This was the same man whom I mentioned before as having made no urine from the Sunday to the Wednesday; all that time he kept discharging "rice-water" stools. At last, on the fourth day, he passed a *little* water, and his alvine evacuations became rather more consistent, and began to look *green;* and from that time he gradually got well. Afterwards I treated my hospital patient in the same way, and with the same event. Yet I will not pretend to say that these persons might not have done quite as well if they had been left entirely to themselves.

phur; tobacco; lead salts; asafœtida; logwood; musk and musk-root; bryonia; pulsatilla; turpentine; belladonna; atropine; pilocarpine; digitalis; caffeine; cocaine; camphor; coto; cannabis Indica; cantharides; capsicum; castoreum; piperine; creolin; chloral-hydrate; acetanilid; alum; antipyrin; phenacetin; cresol; cinnamon; picrate of ammonia; carbonate of ammonia; strychnine; Ignatia; copper salts; iron sub-sulphate, perchloride, and muriate tincture; salol; cor-

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Some of the expedients recommended had certainly a very marked and immediate effect upon the condition of the patients, especially the injection of warm water into the veins. Many instances of this were related at the time. One I myself saw. The patient was a young man, who was nearly moribund, apparently. His pulse had almost if not quite disappeared from the wrist; he was very blue, and his visage was ghastly and cadaverous; in one word, he was in an extreme case of collapse. Out of this he was brought in a few minutes by injecting warm water into one of the veins in the arm. The pulse again became distinct and full; and he sat up, and looked once more like one alive, and spoke in a strong voice. But he soon relapsed; and a repetition of the injection again rallied him, but not so thoroughly; and in the end he sunk irretrievably. Dr. Babington told me of a patient whom he saw speechless and all but dead, and whose veins were injected. He then recovered so as to sit up, and talk, and even joke, with the bystanders; but this amendment did not last either. Yet even this temporary recovery might sometimes be of great importance: might allow a dying man to execute a will, for example.

It was remarked of those who recovered that some got

rosive sublimate; ipecac; naragamine; naphthalin; potassium iodide, bromide, permanganate, sulphate, sulphite, chlorate, bichromate, nitrate; sodium salts; podophyllin; physostigmine; phosphorus and the phosphates; quinine; sulpho-carbolates; arsenic, and arsenical preparations; lime-water; pepsin; silver salts; rhubarb; catechu; kino; matico; bismuth salts; zinc salts; milk, both by stomach and by intravenous injection; coarse salt; ice-bags to spine; hot

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well rapidly and at once; while others fell into a state of continued fever, which frequently proved fatal some time after the violent and peculiar symptoms had ceased. Some, after the vomiting and purging and cramps had departed, died comatose; *over drugged* sometimes, it is to be feared, by opium. And the process of artificially replenishing the veins was certainly attended with much danger. The injection of *air* with the water—inflammation of the vein from violence done to it—an over-repletion and distension of the vessels by the liquid—*might*, any one of them, and sometimes I suppose *did*, occasion the death of the patient. Never, certainly, was the artillery of medicine more vigorously plied—never were her troops more meritoriously active. To many patients, no doubt, this busy interference made all the difference between life and death. But if the balance could be fairly struck, and the exact truth ascertained, I question whether we should find that the aggregate mortality from cholera was any way disturbed by our craft. Excepting always the cases in which preliminary diarrhœa was checked, just as many, though not, perhaps, the very same individuals, would, probably, have survived had no medication whatever been practiced.—Sir Thomas Watson, in "*Practice of Physic.*"

salt-bags to spine; oxygen gas; hot baths; cold baths; wet packs, hot and cold; hot air baths; bleeding; cupping; leeches; hot saline enemas; hot-water and saline injections into veins and bowels (hypodermoclysis and enteroclysis); transfusion, etc.

The evidence on which the majority of these remedies is based is irrelevant and in some cases absurd. Directly a case recovers—as the majority do toward the last end of the epidemic,—sometimes even before convalescence is fairly established, the medical attendant imagines the beneficial result (real or assumed) is due to his individual efforts, and therefore immediately sets pen to paper to record his success, at the same time belittling the efforts of others.

Some of these remedies deserve more than passing notice. Mercury, for instance, has been highly lauded, especially by Dr. Josephus Ayre, who showed that of 725 unequivocal cases treated with it 360 recovered. He fails to state the stage of the epidemic when the success was attained, and also to remember that the revulsive effect of the drug is very difficult to secure under the pathological conditions existing in the malady. Moreover, Sir Wm. Gull and Dr. Wm. Baly, in their "Report on Cholera" to the College of Physicians and Surgeons,* show that under opposite methods of treatment, even in the most severe cases, the average percentage of recoveries ranges from 45 to 55 per

*"The Practice of Medicine," by Tanner. London, 1873.

cent., according to the period of the epidemic—consequently the observations of Dr. Ayre are without force.

Dr. O. D. Norton, of Cincinnati, however, corroborates the evidence of practitioners of the last generation, who held that of all the remedies generally recommended, calomel appears to be the most serviceable. He states he was called one evening to see several men, in the same house, attacked with cholera—all "very ill indeed,"—and ordered mustard sinapisms, at the same time leaving a number of powders of mercurous chloride. On visiting them the succeeding morning, it was found all were very much better, when the attendant declared he had mixed together the entire quantity left for each patient and administered as a single dose. In another very severe case attended by Dr. Norton, and where vomiting persisted in spite of the mercurial, the amount was doubled with each administration until eight scruples constituted the final dose. This last, he remarks, "relieved him; he was never salivated, and never suffered any ill effects from it.* He received no more

* Dr. Norton does not seem to be aware that the dangers of salivation are diminished in proportion to the size of the dose; that while five grains may procure ptyalism, such in the same patient would be impossible in a dose of two scruples, without the intervention of a powerful acid. Nevertheless, the good effect attributed to the calomel, is more likely, considering the history of the drug, to have been a mere coincidence.—S.

medicine, but suitable nourishment, and in three days was up and around."

Castor oil in frequent doses was strongly advised by Dr. George Johnson,* and has recently been advocated by a number of practitioners in the United States as "almost infallible;" but the Medical Council of the Board of Health of Great Britain, after investigating several cases so treated, observed: "The details have been carefully investigated by the Committee, and it appears that in eighty-nine cases of cholera treated by fourteen different practitioners with castor oil, on the plan recommended by Dr. Johnson, sixty-eight were fatal—recovery occurred in only fifteen instances, while six cases still remain under treatment."

Dr. George Steel* details a case in which he first bled the patient in the arm until six ounces were taken; next twenty grains of tobacco were infused in five pints of hot water and employed as an enema, followed by the application of caustic potash over the spine from one extremity to the other. The patient became progressively worse, and when moribund was subjected to the influence of galvanism. "An incision was made over the glosso-pharyngeal nerve, where one wire was inserted, while the other was applied to the epigastrium; he was kept under the galvanic stimulus for three hours. A powerful effect

* Medical Times and Gazette, Sept., 1854.

† The Lancet (of London), vol. ii, 1866.

was produced on the respiratory function. The air expired grew warmer, and his lips and whole countenance, which had been previously livid, became of their natural color. He died about an hour after the galvanism was discontinued."

Mr. John Gason says:* "The abdomen should be tightly swathed with a broad flannel binder sprinkled with chloroform and the patient strictly confined to the horizontal posture [a by no means bad idea.—S.]. As soon as the 'rice-water' evacuations have commenced, and true fæcal evacuations ceased, a tightly rolled-up towel, in length about eight or nine inches, and in circumference about three inches, and moistened with an antiseptic, should be placed length-wise between the buttocks so that the orifice of the rectum may be about midway of the roller. No evacuations of the bowels should be permitted, which will be completely obstructed by the towel."

Dr. George Rogers of Bristol advises "Calomel twenty grains; ginger, five grains; opium, one-eighth grain;" taken in powder every fifteen minutes "until warm perspiration is produced;" and in addition "would suggest—as a diffusible stimulant, diuretic, and astringent—spirits of turpentine in doses of from one to three drachms frequently administered. Having found turpentine *most useful in arresting uterine*

* The Lancet (of London), vol. ii, 1866.

hæmorrhage, and diffusing an instantaneous warmth through the system, I cannot believe but its action would be most beneficial in cholera."*

The formula of Dr. Stone of New Orleans, which was very popular in the South and Southwest, from 1845 to 1856, is much the same as that of Dr. Rogers. It is calomel ten grains, camphor four grains, capsicum one grain, opium one-half grain, with charcoal, chalk, and sugar-of-milk.

Commenting on the foregoing and other equally absurd procedures, Dr. Tanner caustically remarks: "How would the reader desire to be treated should he unfortunately suffer from an attack? Is it probable that he, as a medical man, will wish to take from one to one hundred and twenty grains of calomel every fifteen minutes, or large doses of strychnine repeatedly, or half an ounce of castor oil every half-hour or so until between ten and eighteen ounces have been swallowed; or will he be bled, or allow leeches to be applied around his anus, or have blood transfused into his veins? Will he think it well to be narcotized, or stimulated, or cauterized, or galvanized, or corked up by Mr. Gason, or left to the delicate medication of Mr. George Rogers; or will he, as many have wisely done before, become restive and decline to be tormented and to have his stomach converted into a filthy drug shop?'

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* *Ibid.*

"Should he choose the latter course, it may comfort him to remember that, according to Mr. [Jos. Scott] Bowerbank, when the patients in the prisons and hospitals of Jamaica refused to take the medicine prescribed, they were placed upon a mattress on the floor, with a bucket of iced water and a mug by their side. For the most part, we are told, they received little if any further care; while certainly they were not covered with blankets and rubbed, as the more tractable sufferers were. Nevertheless, the majority of those left to their own resources got well. So, also, Dr. E. A. Parkes tells us that in India the Asiatics were seldom admitted into hospitals until the disease was well marked, as they were either incredulous of the power of medicine, or resigned to the decrees of an inexorable fate; and that he never saw one of them bled. 'Yet the mortality certainly was not greater than among Europeans' [*i. e.*, in hospital—S.]. And finally, it is well known that during the epidemics of 1849 and 1864 very many of those attacked passed safely through the stage of collapse and secondary fever without any treatment; while in a number of other instances the same success attended the use of ice and beef tea only."

A plan of treatment thought by Dr. Tanner deserving of notice, "is that by salines as suggested by Dr. Stevens, in spite of the admission that 'on extended

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* Edinburgh Medical Journal, September, 1866.

trial the failures have been numerous, though by no means so great as with astringents and various preposterous practices.'" The following is the outline as employed in the prison of Coldbath Fields:

"Patients presenting the premonitory symptoms of diarrhœa and vomiting were removed into an observation ward, where an even temperature was maintained. A Seidlitz powder was immediately administered; if sinking was felt without purging, three or four teaspoonsful of Epsom salts were added to the powder. On these agents acting, plenty of thin beef-tea, well seasoned with salt, was given; if there was any pain, a sinapism was applied to the gastric region; and thirst was relieved with seltzer, soda, or pure water, *ad libitum.*"

"If, however, cramps, coldness, or sinking of the pulse came on, the patients were considered as cholera cases in the second degree. The following was then administered, about every half-hour, dissolved in water:

℞ Sodic chloride..... gr. xx.
Sodic carbonate..... gr. xxx.
Potassic chlorate..... gr. vij.

"If there was much irritability of stomach, a large sinapism was applied; if much heat or burning pain, an additional quantity of carbonate of soda added to the mixture.

"In cases in state of collapse, a strong solution of the same salts, dissolved in hot water (100°

Farh.), was thrown into the bowels, and the enema repeated every two or three hours. Sinapisms were also applied to the stomach, between the shoulders, etc.; and in the cold stage, frictions with warm towels were used. A pure air for the patient to breathe was considered of the greatest importance."*

With regard to the foregoing, now being generally lauded as entirely new and novel, it may be remarked it did not originate with Stevens, but is almost as old as cholera itself. It was practiced by the native physicians of the Orient long before the European gained foothold in that part of the world; it was advocated by one Dr. Wm. Marsden, of London, as far back as 1832, and the same gentleman published a treatise thereon which, manifestly, is the basis of later claims.† The fluid recommended by him was practically the same as that of William Stevens, consisting of a "solution of sodium chloride, sodium carbonate, and potassium oxymuriate (chlorate), forty-eight ounces of which, at a temperature of 100° Farh. were slowly injected into the veins of the arms," while every fifteen minutes the same was given by both mouth and rectum. The late Dr. B. B. Brown, of Sacramento, California, employed

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* "On Asiatic Cholera," by William Stevens, London, 1863.

† "Symptoms and Treatment of Malignant Diarrhœa, better known by the name of Asiatic or Malignant Cholera." London, 1834.

Marsden's fluid during the epidemic of 1849, with some success, but was honest enough to acknowledge the source of his remedy. Dr. Rumpf, too, the head of the Eppendorf Hospital, during the early part of the present epidemic in Hamburg, employed for a time saline injections of the strength of one-half of one per cent., but ultimately gave them over in spite of the fact they appeared of temporary benefit; it was observed by him, the same as by Sir Thomas Watson, that the majority of those receiving such treatment, *ultimately died!*

Indeed, in Hamburg, medicine is rarely given, Dr. Reider, assistant at the Allgemeine Krankenhaus, states intra-venous injections of salines appeared "merely of temporary value, and then only in *very few* instances." Tannin enemas, so highly praised "proved wholly ineffective and useless: as did also *camphor*, *ether*, and *salol*, [recently greatly lauded on supposed theoretical grounds.—S.] by the mouth, and the two former subcutaneously." The patients, however, were allowed as much tea and coffee *sans* sugar, and seltzer water, as they desired, some taking as much as six pints of the latter daily; a little pounded ice was occasionally given; hot bottles also employed." Again, he remarks, "if the condition became progressively worse, and the circulation drained of fluid, one or two litres of salt and water were injected into the veins of the arm, and if necessary, later on, into the other arm or the leg.

Sometimes the patients winced at the incision, as at the prick of the hypodermatic syringe, but generally they were so lethargic they appeared not to feel it. "This salt and water injection was given only in extreme cases, and with the exception of one girl, *we did not see any patient live long after it.*"*

Dr. Lauenstein, of Berlin, endeavored to ascertain what treatment would give the best results by devoting one barrack at a time to some one of the many plans advocated; his report is summarized as follows: †

1. *Expectant and Symptomatic.*—This included the administration of wine, analeptics, anodynes, warm stupes, hot baths, friction, hot coffee and tea, with enema of tannin (one to two quarts given, so as to pass up high into the intestine). On the whole he is disposed to think the best results were had from this method.

2. *Hypodermatic Injections of Morphine.*—He gave fair trial to this method, loudly advocated by an American doctor from Memphis. "It was tried in thirty cases, and *did no good whatever.* This consisted of warm subcutaneous injections of: ℞ Acid sulph. dil., 1.00 gramme; morph. sulph., 0.01 gramme; aq., 45.00 grammes; the whole injected at once at blood temperature. In five cases there occurred deep-

* Italics mine.—S.

† British Medical Journal, Oct. 8th, 1892.

seated abscess with gangrenous destruction of the subcutaneous tissues."

3. *Creolin.*—He also gave trial to the creolin treatment, so strongly recommended by Ferd. Hueppe, of Greifswald. "It was administered by the mouth—a two and a half per cent. solution in water, a couple of dessert-spoonsful every two hours,—and also *per rectum* as a high injection; but only one per cent. strength was used for the latter purpose. This also was found of no value. It was most objectionable to the patients, and constantly caused intolerable itching and burning." Dr. Lauenstein briefly characterized as a "horse cure" (*Pferde-Kur*).

4. *Tannin and Lactic Acid.*—Lastly he used very largely the method introduced and strongly recommended by Professor Cantani, of Naples, during the epidemic of 1884, consisting of copious high intestinal injections of warm one per cent. solution of tannin, and lactic acid by the mouth against vomiting; the lactic acid administered in a solution of thirty parts to five hundred of water. "No good whatever was obtained by the use of the lactic acid, and it was greatly objected to by the patients. The tannin injections, sometimes, seemed to do good, and the patients generally felt better after them, when the colicky pains which often ensued had passed off. That the tannin in no way acts as a disinfectant, is clear from the existence of active bacilli in the bowels of a convalescent patient for whom they had been freely used."

5. *Intravenous and Subcutaneous Injections.*—For both purposes, a solution of six-tenths per cent. of common salt, rendered slightly alkaline by bicarbonate of sodium, in water sterilized by boiling, was used. "The quantities given subcutaneously varied from one, to one and a half litres (about two to three pints), and intravenously even as much as two litres (somewhat more than two quarts); the transfusion, in both cases, made by gravitation only. The effect was sometimes astounding; the cyanotic, algid, pulseless, breathless creature, with shrunken wrinkled features, sunken lack-lustre eyes, and the whole aspect of a moribund, would, as if from a deep sleep, arouse himself, and tell the delighted doctor he felt vastly better; but *unfortunatety the results were not always lasting.*"

It may not be amiss in this connection to reproduce the utterances of The Lancet, of London, on factitious death in cholera, and the use of salines for resuscitation:

"There are special causes for the uneasiness, not to say positive panic, which the slightest hint of the advance of cholera arouses in the populations of Southern Europe, particularly among the Mediterranean shores. Their custom of allowing but a few hours' interval, sometimes hardly a day, to elapse between decease and burial, has on the occasion of increased mortality from epidemics induced certificates of death to be prematurely given, with the hor-

rible result that apparent corpses have come to life on their way to the tomb, or the crematorium, and with the necessary inference that not a few must have been buried or cremated when the vital spark, so far from being extinct, might still have been kept alive. The great Tuscan pathologist, Filippo Pacini, some thirty years ago, published a memorable pamphlet on 'La Morte Apparente della Colèra' and having instanced a number of cases in which the seeming corpse had been snatched from the very brink of the grave, he proceeded to give rules by which even in collapse the apparent victim to cholera might be resuscitated.

"Among his prescriptions, that of the intravenous injection of bay salt, as suggested and practiced in 1832 by Dr. James Mac Intosh of Edinburgh, held a prominent place, and by this means, particularly in the cholera visitations of 1877 and 1884, the restoration to life of many duly certified as dead was just in the nick of time effected. In the latter year, however, a remarkable and extremely painful instance of the all-too-tardy resort to the practice occurred in the person of a distinguished Genoese physician, who having overworked himself in the public cause during the epidemic, was himself stricken down just when it was in full retreat. Every care was bestowed upon him, but he rapidly sank into collapse, and within forty-eight hours was thought to be, and certified as, dead. Burial arrangements were in progress, and the family, sitting disconsolate in a room adjoining that in which

he was laid in his shroud for burial, were expecting the arrival of the undertaker every moment, when, to their mingled horror and delight, the door was feebly opened, the apparent corpse presented himself and, in a voice scarcely audible from weakness, remonstrated with them for having left him so long unattended. Instantly they conveyed him back to bed, and employed, under the best professional advice available, every means that could be imagined for his rescue; but in vain. He died a few hours after of cardiac failure.

"This case was much commented on at the time as a typical example of what might occur on the strength of death certificates prematurely given, and so Pacini's method was reapplied with enhanced vigilance on every cholera patient who had reached the stage of collapse. The epidemic ran its course; the panic and the vigilance born of it disappeared, till now, when cholera is again within measurable distance of the Mediterranean seaboard, Pacini's name and practice are once more trotted out. The Southern populations, however, must surely have learned by this time that prevention is a better safeguard than cure, be it as ingenious as it may, and that to leave their ports in a mediæval state of filth and neglect, invites those cholera explosions that never occur on so sudden and so vast a scale in the more civilized harbor towns of the British Isles or of the Dutch and Danish coasts. With the experience of Naples and

Spezzia still recent, sanitary rehabilitation must have made some way toward the protection of regions to which quarantine and hygienic cordons have ceased to give the security so long laid to their credit."

Lieutenant Colonel and Surgeon R. Lewins, commenting on the above, in a letter to The Lancet, says:

"The Dr. James Mac Intosh alluded to is doubtless Dr. John Mackintosh, for many years extra-academical lecturer to the Argyle-square Medical School. On consulting his work on the 'Practice of Physic,' it will be seen that he gives the credit of originating this heroic treatment of a disease that 'begins with death' (as he was accustomed in his lectures to term cholera) to Drs. Latta and Lewins, of Leith, in which seaport the epidemic of 1832 was particularly malignant. The latter named physician was my father, and I have often heard him speak of the improvement effected by the warm salt-water injection as *only temporary, and in no single case resulting in recovery*, as apparently claimed for Dr. Pacini, practically, in The Lancet."

CHAPTER XI.

GENERAL MANAGEMENT DURING EPIDEMICS.

There is, perhaps, no malady so fatal to the overweening self-confidence and egoism of the medical man as cholera, especially in its well-marked asphyctic stage. During an epidemic even the most careful prophylactic treatment may fail, and it may be impossible to fulfill the indications from the cause or from the disease. The immunity of individuals is generally in proportion to vital resistance and the hygienic surroundings that tend towards good health, and it is an error to imagine vital resistance is in proportion to muscular energy; hence it is not astonishing that very vigorous persons are frequently stricken by the malady, while others possessed of less physical powers escape. Besides the more or less complete immunity inherent to individuals, there is likewise a temporary immunity which is left after the epidemic has in a great measure exhausted itself. In almost every plague of this character, especially after its fastigium has been reached and passed, and the number of fatalities are in greatly less proportion than the recoveries, certain specifics are wont to be recommended by medical men of all degrees—by the reputable practitioner no less than the charlatan; yet the reputation of such specifics has always been so ephemeral as to never persist beyond the first week of the next succeeding epidemic. Those last heralded as *new* and based upon the assumption the intestines are the seat

of the lesion, such as salol, copper arsenite, tannin, muriatic and sulphuric acids, hot water and saline injections (enteroclysis and hypodermoclysis) with the exception of the two first, do not even possess the merit of novelty; they have been repeatedly tried and found wanting; in the meantime the older panaceas, such as opium, camphor, calomel, ether, cajeput oil, etc., are returned to (for lack of better knowledge, and in the vain hope they *may* prove of some little benefit), only to be thrown aside in despair.

It is practically useless to look for any form of therapeusis that demands the administration of drugs by either mouth or rectum, since the mucous membrane of the *prima viæ* is unable to absorb in the slightest degree if the attack is in any way serious, and even in the milder ravages of the disease is incompetent to perform its function save in a relative and most imperfect manner. From the earliest appearance of cholera in Europe to the present time, a large proportion of practitioners have depended solely upon some mixture containing opium or camphor, and teachers sedulously recommend the same for lack of better knowledge, typical remedies of this class being Squibb's cholera mixture, the so-called Russian cholera drops, etc.*

Again, aside from the fact the mucous membrane

*℞ Tinct. valerian æth., 2 drachms; wine of ipecac, 1 drachm; laudanum, 1 scruple; oil of peppermint, 5 minims. —S.

is incapable of absorbing, it could hardly be expected that any remedy could develop its action in the presence of a large quantity of "rice-water" fluid. Moreover, it has repeatedly been proven that active interference is more injurious than a simple mode of treatment, and it may be added this is almost even more true of the third stage, or period of reaction, than of the attack itself.

From the evidence just presented, and that moreover embodied in the preceding chapter, the practitioner will, I am sure, realize the inutility of extravagant methods of therapeutics, and consequently scout all measures that tend to worry the sufferer with nauseous remedies.

That there is no such thing as an antidote—in the full acceptation of the word—to cholera, remains incontestable; yet this is no reason why the practitioner should idly fold his hands under the supposition he can be of no service, or that the chances are equally as great without as with his intervention. This is not necessarily true, for it must be remembered there are a large number of cases of severe diarrhœa, and likewise cholerine, that if deprived of proper care will be merged into cholera; such fact merits strict attention. Neither is cholera proper, the form that asserts itself without premonition or warning, always beyond reach if physiological phenomena are considered, and met strictly in accordance with their manifestations by logical means of therapeusis.

During a cholera epidemic, the supervention of any form of malaise, especially if accompanied with looseness of the bowels, should be regarded with suspicion, particularly where the habits of life of the patient are known to be irregular, "loose," or "fast." It may be only a passing evidence of indigestion due to indiscretions in appetite, yet it is best always to be on the safe side; even an indiscretion *may* become the focus through which the cholera poison finds opportunity to assert itself; for there is, after all, more truth than speculation in the common saying that in the time of a cholera epidemic "the disease is in the air." I have already shown that telluric and meteorologic influences have a decided bearing on predisposition, dissemination, and recovery; it is also well known that in cholera times even a minor surgical operation may induce or favor the malady through shock, no matter how limited, to the nervous system. Lebert remarks when cholera seizes women in the puerperal bed, abortion takes place, and the disease is usually fatal. "I had in my own practice," he adds, "a sad case of this kind in which, notwithstanding the most energetic treatment of the prodromal diarrhœa, the disease continued on uninterruptedly to the fatal end." He likewise observed in Velpeau's Clinic, in Paris, in 1849, that the most trivial operations, such as lancing an abscess, extirpation of a sebaceous cyst, puncture of a hydrocele, etc., led to cholera.

First of all, when an attack of cholera, cholerine,

or even diarrhœa supervenes, as a measure of safety the patient should be isolated so far as possible, and in a way to secure the greatest amount of pure fresh air; at the same time an even temperature must be maintained in the apartment.

Second, great care is to be taken that his drinking water is pure, particularly that it has not stood in a receptacle for any length of time, or been drawn from a well near any sewer, or any river receiving filth and drainage; it may in any event, with advantage be boiled, cooled, and iced. Or he may drink freely of aërated waters, iced coffee or tea, etc.—warm drinks are objectionable, especially hot tea, as it tends to favor nausea. If no carbonated water of good quality is available, effervescent powders may be employed, made from four parts of bicarbonate of soda and three parts tartaric or citric acid, administered from time to time in a few teaspoonsful of water; another agreeable and refreshing beverage is made by adding to a moderately sweetened solution of potassium bicarbonate and sodium bicarbonate, a sufficient measure of newly expressed lemon or lime juice.—These mixtures all, of course, to be taken at the moment of effervescence, else their value is in considerable measure inhibited. The carbonic acid gas introduced into the gastric viscus seems to serve the purpose, not alone of relieving thirst which is very intense in real cholera (especially after diarrhœa has persisted some time, evidencing that

this symptom is a manifestation of the economy at large protesting against the extensive withdrawal of fluids), but of stimulating the sympathetic system through the endings of the nerve fibrills in the stomach, whereby nausea is allayed, and transudation of serum through the intestinal walls in some measure inhibited. It is often advisable to permit pieces of ice, varying in size from a pea to a filbert, to be swallowed at intervals of every three or five minutes, and between the ingestions of carbonated water.

If the attack presents no manifestation other than diarrhœa, as a measure of safety the patient should remain supine in bed, partaking of cooling drinks, and be carefully nursed; everything should be done to ensure composure of mind. Subcutaneous injections of small doses of morphine muriate may be given to relieve pain; but the manifestations are usually best met by some sedative mixture, such as chlor-anodyne, administered perhaps upon loaf sugar. Chlor-anodyne contains, beside morphine muriate, chloroform and hydrocyanic acid—the latter the most effective remedy, by the stomach, that has yet been found in combating true cholera,—capsicum and cannabis Indica; hypodermatic injections of morphine at most are but mere palliatives, and in cholera are especially prone to induce abscesses, deep-seated suppurations, and sometimes *gangrene!* * If deemed

* The muriate salt is less likely, in this disease, to provoke accidents.—S.

essential, sinapisms or poultices may be applied to the abdomen and held in position by a broad flannel bandage snugly applied, and reaching from the illia to the xiphoid cartilage; better, by far, than these is half a dozen thickness of flannel, saturated with a mixture of chloroform and alcohol, one part of the former to twelve of the latter, topped by rubber cloth or oiled silk to prevent too rapid evaporation, confined to the body by the bandage.

The diet should be light, nutritious, properly cooled, and largely of farinaceous character. The stools should invariably be cremated, since, as has already been shown, a diarrhœa of very moderate character may carry the poison, that by fermentation in suitable media, and reduplication, becomes a serious menace to the health of others. Says Prof. Lebert:

"When the cholera poison has once reached the small intestine through the air or through fluids, the development of its action within the economy depends partly upon the quantity in which it has been introduced, and partly upon the favorable and unfavorable conditions that may be encountered. In some individuals, it passes through without leaving a trace. In others the effect is exhausted in an intestinal irritation [reflex of the central nervous system.—S.] of one or several days duration, manifested in a diarrhœa. In not a few the poison rapidly increases, when occurs either a grave attack of cholera, without prodromic

diarrhœa, or the diarrhœa sets in and develops into regular cholera in a few hours, or one or two days. In still other cases again, there is neither a cholera diarrhœa, nor a cholera attack with its colorless stools, but only a moderately violent attack of vomiting and diarrhœa, or cholerine, which scarcely differs from a cholera nostras. But all these forms belong together; each may pass into the others, and each may show besides the most favorable symptoms, individual manifestations of the most pronounced attack."*

*"Vortage über die Cholera," Erlangen, 1864.

CHAPTER XII.

MANAGEMENT OF PRONOUNCED CHOLERA.

So far, latterly, I have dealt more particularly with threatened cholera, or the more simple and uncertain manifestations of the malady. I will now consider the more serious form premising, as heretofore stated, that the term Cholera as generally understood, is applicable only in a generic (instead of specific) sense; that properly it covers the diseases ordinarily differentiated as Asiatic or epidemic cholera, sporadic cholera, cholera morbus (cholera nostras, English cholera), cholerine, cholera infantum, cholera diarrhœa, and, likewise, certain forms of "summer" and "winter" diarrhœa; that these affections are one in character, and although presenting different degrees, bear the same ætiological relations and are dominated by the same pathological principle, consequently, to a greater or less degree, must be amenable to like methods of management. Moreover, a large number of eminent authorities, Indian and European, have given expression to similar opinions, notably Orton, who (cited by Aitkin) maintained as early as 1832 that the disease presented "as many diversities of aspect and symptoms as scarlet fever, for between serious cases and those of only ordinary intensity a disparity fully as considerable is to be remarked." Also, Dr. Scriven, in a communication to

the Epidemiological Society of London, admits sporadic and epidemic cholera are of precisely the same nature, "just as sporadic variola resembles its epidemic form." Likewise, Dr. Guérin, before the Academy of Medicine of France, recently asserted the "distinction made between the different forms is purely arbitrary," and that "this affection exhibits special variation in intensity,"—thus corroborating Dr. Dutrieux Bey (of Alexandria) and Surgeons J. M. and D. D. Cunningham, T. R. Lewis, Sir J. J. Frayer, Max von Pettenkofer, and others. Indeed, Pettenkofer insists that the dejections of persons suffering from so-called cholera morbus or cholera nostras, or from cholerine or its lesser form cholera diarrhœa, under suitable surroundings, are as capable as those of epidemic cholera of provoking the most extreme form of the infliction.

In the management of these diseases, then, it is necessary to bear in mind their relationship as well as their individual and collective factors, and at the same time to establish some pathological data as a point of departure. This latter, in a measure, I have attempted to delineate elsewhere, pointing out the unmistakable evidence of poisoning of the central nervous system and the influence thereby manifested upon and through the great sympathetic. It is likewise essential to remember (as elsewhere stated), that this toxicity may already be complete to the point of fatality ere its first manifestations are revealed externally, or

brought within the range of diagnostic perceptivity; and for these reasons cholera, in its most extreme form, must ever remain a fatal scourge, baffling to those who practice the medical art.

At the risk of prolixity it may be well to refer again to the evidences of the pathology. Note then:

The intimate relation of the seat of all local pathology to the great sympathetic:

The close resemblance of cholera in certain forms to certain manifestations of tabes; likewise to the toxicity induced by poisons acting directly upon the central or general nervous system,* and that death supervenes through nervous exhaustion, the usual manifestations of this form of toxication as encountered in the intestine being exhibited in greater or less degree (even to absence) in proportion to the degree of poisoning:

The entire lack oftentimes of local pathology, particularly in the more aggravated and malignant forms of the malady:

The evidence of paralysis induced in those portions of the body which are governed by the great sympathetic, as by desquamation of intestinal epithelium, etc.; also the transudation of serum indicat-

* It must be remembered Virchow long since proved that arsenic introduced directly into the circulation produces all its peculiar phenomena, and much more readily than when introduced by the stomach.—S.

ing paralysis or hyperæsthesia of certain portions of the sympathetic *per se:*

The reflex suppression of urine, and changes that frequently take place in the kidneys, yet never result in chronicity:

The eyes sunken in their orbits, and insensibility of conjunctiva and cornea, indicating sympathetic inhibition in the cervical area:

Manifest evidences of nerve degeneration in all the different tissues and organs; the (according to Doyère) diminished exhalation of carbonic acid gas —for reasons given in a previous chapter; the rise of temperature after death coupled with the fact dead bodies cool off but slowly—Lebert unhesitatingly declares the sensorum is early affected:

The peculiar sopor; the manifest anæsthesia, hyperæsthesia and paralysis, affecting not only the surface of the body but the vital organs themselves; the manifestations afforded by the tongue; the peculiar bitter, nasty, pasty taste within the mouth:

Susceptibility to shock—the most trivial surgical operations, performed upon those seized even in the slightest degree with the malady, induce most serious and usually fatal consequences:

Death with all the manifestations of uræmic toxication:

The indican found in the urine, which is ever an evidence of profound nerve exhaustion; the lack of tonicity of certain nerve-plexuses such as the cœliac,

the solar, the uterine; the readiness with which abscesses, furuncles, etc., supervene; the total inhibition of secretion in the third stage—this, of course, as the result of transudation, since all secretion is blood-depuration:

The depression of temperature below normal:

The watery diarrhœa and vomiting, both fluids being colorless and odorless—"Uncontrollable watery diarrhœa is an outcome of terror and nerve perturbation" (Fothergill):

Flagging circulation with more rapid heart-beat; death with the heart in diastole—a peculiarity which obtains to toxicity from serpent-venom; spasm of arterioles and contractile circular muscular fibres (even of bronchi, proximate and ultimate)—this in connection with the transudation of serum, fully accounts for the terrible cramps:

Finally, the well known fact that the pathology of the disease as exhibited, is in no way commensurate to the character of its manifestations either in its minimum or maximum; the readiness with which the malady is superinduced upon any act or phenomenon that provokes or tends towards depression of the nervous system (wine suppers, excessive venery, etc.); the mental relations; the slow recovery, often dependent upon an intermediate typhoid stage.—And there is every evidence of extremely low nervous vitality which cannot be relegated to the local lesion, neither is the latter capable in any degree of account-

ing for the transudation of serous matters from the circulation!

Thus the influence of the nervous system is made most manifest in subjective and objective symptoms. The vomitings and numerous stools result from either a paralytic or a hyperæsthetic condition of the sympathetic—conditions that, apparently antagonistic, as before shown, are physiologically the same, differing only in degree. The crises, cramps, vertigo, anxiety, aphonia, spasms, tremors, all betray their neural origin; the evidences of collapse, and the algidity, are dependent upon the hyperæsthetic (or irritative) and hypertrophic condition of the sympathetic system; while to the vaso-motor nerves may be attributed that depression of the function of respiration and circulation which constitutes the most dangerous symptom of the malady. Again, the entire series of symptoms are precisely paralleled in the toxic manifestations of certain cadaveric alkaloids, one of which, (muscarine), as before remarked, is had both as an animal and vegetable alkaloid, and is likewise one of the most powerful nerve poisons known.

The practical application of admitted physiological and pathological principles, and the discovery of constant relations of cause and effect, suggest the idea of a well-defined law in this affection. And, moreover, since it is to the sympathetic system that must be referred the depression of the functions of respiration and circulation, therefore in antagonism

of this system is afforded the key to rational and physiological treatment.

The fact may be recalled that the sympathetic pertains to the vaso-motor system, and that the inhibitory nerve in most complete relation thereto is the pneumogastric, which unites with the sympathetic to form the cardiac, solar and hypogastric plexuses; that the pneumogastric (vagus) possesses an action antagonistic to that of the sympathetic on the heart. The vagus and sympathetic are also in intimate connection in certain secondary plexuses, as the aortic, spermatic, renal etc.

Again, the parts chiefly supplied with sympathetic nerves are usually capable of none but involuntary movements, and when the cerebrum acts upon them at all, it is only through strong excitement, the depressing influence of some passion, or through some voluntary movement with which the actions of the involuntary part are commonly associated. Also, it should be remembered the solar plexus lies directly behind the stomach, and is the one to which must particularly be referred the peculiar derangements that occur in the splanchnic area as the result of the cholera poison.

Thanks then to modern physiological research and clinical observation, we know that the pneumograstric or vagus, which is a cerebro-spinal nerve, is an antagonistic and controlling agent. As already shown, to the vaso-motors must be referred the de-

pression of the functions of respiration and circulation, which constitute the gravest symptoms of cholera, proof of which is found in the rapid deaths supervening upon *cholera sicca*, or "dry cholera," which have been observed during certain epidemics, and on many occasions overtakes individuals apparently in full tide of health. Again, the fatal result in a large proportion of cases of asphyctic cholera, is usually preventable by the use of hydrocyanic acid or the dilute virus of *antiaris toxifera.* The prompt relief which may be afforded in such cases if seen at the very onset of the asphyctic manifestations—cases apparently the most desperate,—conflicts with the opinion that cholera is a serious organic affection.

By stimulating the sympathetic part of the heart its contractions are augmented; but by acting thus on the vagus it is possible to arrest the heart in full diastole. The stimulation of the vagus then is an important indication; that is, the re-establishment of the cardio-inhibitory functions of this nerve, which are evidently absent in cholera. By so doing the violent contractions and palpitations cease, and the energies of the heart cavities (especially those of the left side), are restored; the congestions of the pulmonary and cutaneous system likewise disappear.

In all attacks of cholera, then, regardless of the stage, the first indications are to stimulate the vaso-inhibitory apparatus and antagonize the sympathetic

(especially in its cardiac and solar plexuses) by sedation, by reflex, or by both.

The success which is sometimes obtained in the lesser degrees of the malady from internal administration of camphor, chloroform, ether, etc., is due entirely to their action upon the sympathetic system; but such are available only when absorption is in greater or less degree possible. The remedies most valuable for sedation of sympathetic are in order: Hydrocyanic acid, antiaris toxifera, chloroform, cocaine, cannabis Indica. As before noted we have in chlor-anodyne a preparation which contains certain of these remedies in combination (notably, the hydrocyanic acid, chloroform and cannabis Indica) in connection with morphine and capsicum. This is a preparation that is not alone an improvement upon the old proprietary chlorodyne, but by the dropping of certain inert and nauseous ingredients, is far less antagonistic to sensitive or irritated stomachs. The action of this fluid is in a measure dual, in that it allays the irritation of the sympathetic induced by the cholera poison, and at the same time stimulates the vaso-inhibitory apparatus, thereby relieving the spasmodic congestion of the arterioles that leads to oppression and depression of both cardiac and pulmonary functions. It is still further valuable in that it is intensified by the powerful revulsive effect of the contained capsicum.—Coca cordial too, for like reasons, often has a most satisfactory effect.

In more severe cases, or in cases where chloranodyne is not sufficient, the sympathetic may be further and more powerfully antagonized by stimulation of the pneumogastric, as advocated by Dr. Alexander Harkin (and later by Groneman), and so successfully employed in Malta during the epidemic of 1887. Three preparations are available for this purpose, presenting varying degrees of intensity:

(1) Equal parts of saturated tinctures of ginger and capsicum:

(2) Either the oil of mustard or oil of horseradish: Croton oil has been suggested, but is altogether too slow and too uncertain in action:

(3) Finally, the epispastic liquor of the British Pharmacopœia, made by percolating five parts of cantharides with twenty parts of acetic ether.

Whichever is deemed necessary to employ, it should be applied freely over the branches of the pneumogastric in the neck, beneath, in front of and behind the ear, covering three inches of surface, preferably on the right side—Coleman having demonstrated the right vagus commands the smaller intestine. But if the case be one of extreme urgency, the liquid may also be applied beneath the eye; or, if desired, both right and left vagi may be excited.

The effect is almost instantaneous—in some instances, quite so,—and all morbid phenomena are annihilated long before vesication takes place. The purging, the vomiting, and the cramps cease; the

patient falls asleep to find, on awakening again, he is entirely relieved from misery.

With the first two preparations, if mitigated at all, vesication may perhaps be avoided; but in cases of marked collapse, the epispastic liquid should receive entire preference; if desired, it may be used on all occasions, to the exclusion of the others, and certainly is safer.

Bear in mind carefully the fact, that absorption, so far as the *prima viæ* is concerned, is in the main inhibited; yet hydrocyanic acid, chloroform, coca cordial, or the chlor-anodyne compound may, if desired, be given by the mouth in full doses, as their volatile character insures the maximum of absorption when absorption is at all possible.

It is needless to dwell on the importance of rapidity of relief in a malady where every movement is fraught with danger, or call attention to the calmative effects of this treatment upon the nervous system, as evidenced by its sleep-inducing powers in the presence of intense suffering; to its efficacy in restoring the balance of circulation and respiration; of at once aborting or jugulating the disease, and of preventing the possibility of lapsing into a typhoid condition or secondary fever so fatal in prolonged cases. That the same topical remedy is of equal efficacy in every phase of the disease, if desired to employ it, from "summer" diarrhœa up through cholera diarrhœa, cholerine, cholera nostras, to so called Asiatic cholera,

strengthens the presumption that they are pathologically one and the same malady; and likewise affords another illustration of the soundness of Dr. Peter Latham's apothegm,* viz., "that the treatment of diseases, rightly considered, is part of their pathology. What they need and what they can bear, the kind and strength of the remedy, and the changes which follow its application, are among the surest tests of nature and tendency."

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* "Latham on Diseases of the Heart."

CHAPTER XIII.

EVIDENCES OF VALUE OF VAGUS TREATMENT.

Herewith are embodied certain reports afforded by the kindness of Dr. Alexander Harkin of Belfast, Ireland. Dr. Harkin says:

"In 1885 cholera was very prevalent on the Continent, but happily did not get footing on our shores (Great Britain). Two years later, however, it made an incursion on Malta, and I then took advantage of its presence to have my theory thoroughly tested by competent and independent authority, and for this purpose, at the instance of my friend Lord Knutsford (then Sir Henry Holland, Secretary of State for the Colonies), forwarded a copy of my brochure on the nature and treatment of sporadic and epidemic cholera to Sir Lintorn Simmons, Lieutenant-Governor of Malta, with the request he invite the attention of the medical faculty of the Island to the work. This was done. The medical men loyally responded to the call, with what result the official reports will show.

"I desire now to present independent testimony as to the value of the effects of the treatment in English cholera in all its phases, from an English practitioner of standing and position, personally unknown to me, who communicated the same to the profession through the medium of The Lancet. I refer to Dr.

Harry Pool Berry, who, in a letter headed 'Stimulation of the Vagus,' writes:

"In an annotation you state the success attending the treatment recommended by Dr. Harkin is 'almost too good to be true.' This may be so. Fortunately I have had no opportunity of trying the remedy in Asiatic cholera; but as to its being remarkably effective in English cholera, or the summer diarrhœas and vomitings which we so frequently meet with, I feel convinced after repeated trials. The letter of Dr. Harkin appearing in The Lancet of August 16th, 1884, was pointed out to me by Mr. Thurston, of Ashford, and since I have tried the external application in the manner described,—viz. blistering behind the angle of the jaw—in at least twenty cases which were more or less severe, and varying from infancy to old age. In all the cases the treatment was attended with marked and immediate success, the vomiting and diarrhœa being controlled almost at once; in some of these cases I had vainly tried acids and opium, catechu, chalk, logwood, etc., in the usual doses. It is, at any rate, a method of treatment which is attended by no risk, and in no way interferes with any other which the practitioner may see fit to carry on."*

The Lancet of October 3d, 1885, remarks:

"So much success has apparently attended the mode of treatment recommended by Dr. Alexander Harkin that no apology is needed for reminding our

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* Dr. Berry, on November 18th, 1889, wrote Dr. Harkin, confirming his previously expressed opinion after increased experience.—S.

readers of it. The treatment is in itself remarkably simple—viz., stimulation of the vagus nerve so as to inhibit the action of the sympathetic on the abdomen—for from a consideration of the phenomena of cholera, Dr. Harkin arrived at the conclusion foreshadowed half a century ago by Dr. MacCormac, that in the inordinate action of the sympathetic we have an explanation of the violent purging, cramps, and other characteristic symptoms; and he argues from known physiological effects of the relations between the vagus and the sympathetic to the trial of the remedial measure above stated. Certainly the cases cited by him are striking instances of the rapidity and efficiency of his plan in severe choleraic diarrhœa, and it is incumbent upon those who have to deal with the graver malady to prove the value of Dr. Harkin's recommendations. If by so simple a means he has really discovered a remedy which will diminish the high rate of mortality in cholera, he will have rendered a great service to medicine and to humanity at large. Formerly, in the diarrhœal stage Dr. Harkin employed the routine plan of absolute rest, warmth, counter-irritation to the abdomen, liquid diet, and the administration of sulphuric acid and opium. Now, when at liberty to do so, he discards all internal remedies, and merely applies some epispastic fluid with a camel's-hair pencil, commencing behind the ear and extending on the course of the pneumogastric nerve as far as the angle of the lower jaw. The result is that the purging at once ceases; the patient quickly falls asleep, and awakes cured long before vesication takes full effect. So, also, in the second and algid stages the same good result is experienced. It is almost too good to be true."

Prof. Pisani, in his comprehensive "Report upon

Cholera in Malta in 1887," declares the disease was first manifested in the Island on July 25th, was officially notified on the third of the succeeding month, clean bills of health being delivered on the 11th of November. It does not appear, however, from various causes, that there is any record of Dr. Harkin's treatment being adopted until the 31st of August. In this report, which is largely historical and topographical, Dr. Pisani, referring to this treatment, states: "In many cases the improvement was very rapid after the protracted sleep which followed the counter-irritation of the vagus nerve of one (the right) or of both sides."

Again, chiefly at Zabbar, Zeitun and Manoel Hospitals, strong counter-irritation was applied to the pneumogastric on the right side, or on both sides, on that portion lying between the mastoid process and the angle of the lower jaw. It acted "frequently like magic, the patient sleeping after its use and awaking well."

I now offer a transcript of the evidence obtained in Zabbar and Zeitun Hospitals by Drs. Inglott and Cannataci, the opportunity of reproducing being afforded me through the courtesy of Dr. Harkin. He remarks, "unfortunately, there were no records preserved at the Manoel Hospital, which was merely improvised for the occasion."

Dr. Inglott's Report:—"Dr. Harkin found a direct means of acting on the sympathetic nerves independ-

ently of the rest of the nervous system. This means consisted in counter-irritation over the vagus which I have successfully applied not only in epidemic cholera, but also in whooping-cough. The treatment in my hands proved to be very beneficial, and my personal experience during the late epidemic is quite in accord with Dr. Harkin's opinions. Often cases of very severe type were arrested by means of this treatment when all other resources had been employed in vain. The treatment was also used by my friend, Dr. Cannataci, while in charge of Zeitun Hospital, and we worked together hand in hand, helping each other, communicating daily our observations. Dr. Harkin's treatment acted in our hands in most cases like magic. I am glad to be able to state my conviction that we saved several patients from death by such means. I remember well, in the Zeitun Hospital, the case of a poor boy, eight years of age who was in so advanced a stage of algidity there was very little hope of saving his life; all internal remedies had failed. I was quite astonished on seeing him, after apparently dying in the morning, quite convalescent in the afternoon as the result of strong vesication over the vagus. In conclusion, I have no hesitation in saying that Dr. Harkin's treatment is a remedy both reliable and speedy in its action in all severe cases of cholera."

Dr. Cannataci commences his report by confessing the vagus treatment failed in several instances, but in

many more "acted like magic." Herewith is presented a summary of cases as outlined by Drs. Inglott and Cannataci:

CASE I.—William Quintal, 7 years of age, was removed to the Zabbar Hospital, on August 31st, 1887, at 10 P.M.

Actual Condition.—Eyes very hollow; lips violet; hands and forearms cold; neck and upper part of the chest of bluish color; intense diarrhœa and vomiting; voice feeble; cramps very severe; thirst intense; suppression of urine; pulse imperceptible; extreme weakness; the patient refused to take internal medicine. Dr. Harkin's treatment applied at once. After sixty minutes the patient slept for nearly three hours, and soon after took lemonade with ice and cognac.

Sept. 1st, 3 A.M.—Counter-irritation was applied again on the left side of the neck.

At 7 A.M. the patient took coffee and milk, and continued to improve. After two days he left the Hospital, weak, but perfectly cured.

CASE II.—Carmela Briffa, 49 years of age, was admitted into Zabbar Hospital on Sept. 4th, 1887, at 7 A.M. During the night she had slight diarrhœa, preceded by chill and perspiration, which were neglected; soon after she had vomiting. At 6:30 A.M. I was called to assist her; at 7 she was removed to Hospital.

Actual Condition.—Face livid and violet; cramps very violent in the upper and lower extremities—the pain produced contortions of the face; eyes sunken in their orbits, encircled by a dark blue line; aphonia; dejections resembling "rice-water;" expression of great anxiety; tongue dry; hands violet; whole body cold; suppression of urine.

Treatment.— 7 A.M., injections of ether and stimulants by the mouth; 8 A.M, same state; 9 A.M., thirst intense, pulse very weak, cramps severe, vomiting and diarrhœa; 2 P.M., no change up to this hour. Counter-irritation on both sides of the neck. At 3 P.M., slightly disposed to sleep; pulse active, no cramps, no vomiting, one stool; 5 P.M., slept one hour; soon after took some coffee with brandy; 11 P.M., improving.

Sept. 5th.—4 P.M., passed a very good night; declared convalescent; beef-tea, Marsala wine.

Sept 7th.—At 10 A.M., left the Hospital perfectly recovered.

CASE III.—Antonio Abela, married, laborer, 27 years of age, was admitted into Zabbar Hospital on Sept. 11th, 1887. On the 10th he had been taken ill, nearly at midnight; after that he committed dietetical errors, eating a quantity of fish commonly called lamperchi. At 8 A.M., September 11th, I was called to visit him.

Actual Condition.—Universal cramps; expression of intense suffering; voice extremely feeble; face violet and livid, eyes sunken in their orbits; vomiting very intense; no diarrhœa; whole body cold; pulse imperceptible; respiration very difficult; suppression of urine. Removed patient at once to Hospital.

Treatment.—Injection of ether; stimulant mixtures.

9 A.M.—Vesication over the vagus on the left side of neck.

11 A.M.—Found patient had slept nearly one hour; cramps stopped, pulse active, vomiting suppressed, urine passed freely. The patient, in my presence, took some broth and two spoonsful of Marsala wine. He continued to improve daily, and after a few days left the Hospital able to work.

Case IV.—Guiseppe Galt, 42 years of age, shopkeeper, residing at Vicolo, San Francesci, Zabbar. This patient watched his wife when attacked with cholera with great anxiety, but she refused to undergo the vagus treatment, and died thirty hours after seizure. Four hours after her death he was seized with violent diarrhœa, and refused to be removed to Hospital. The following were the symptoms observed:—Diarrhœa very intense ("rice-water"); vomiting; eyes very hollow; lips violet; body cold; voice feeble; pulse weak; respiration disturbed; sense of oppression; thirst intense; cramps very severe in the lower extremities; general debility; suppression of urine.

Treatment.—Injections of ether, vesication very strong over the vagus on both sides of the neck. After two hours I visited the patient again, and found he had slept nearly one hour; cramps stopped; pulse active; diarrhœa suppressed; urine passed freely. I called again to visit the patient in the afternoon, and found him weak but recovered. The vagus treatment acted like magic!

Case V.—Michele Buchagica, 52 years of age, was seized with violent vomiting and diarrhœa on Sept. 12th, 1887, at 11 P. M. I was called to visit him at his residence, Vicolo, San Francesci, Zabbar.

Symptoms.—Eyes very hollow; hands, forearms, neck and upper part of chest cold; thirst intense; diarrhœa ("rice-water"); vomiting; sense of great oppression; voice very weak; pulse almost imperceptible; cramps confined exclusively to the lower extremities.

Treatment.—Used at the very moment the epispastic fluid on both sides of the neck, and prescribed a stimulant mixture. After four hours I visited again

and found him convalescent. Being very weak, I advised to continue the stimulant mixture, and likewise to take milk with cognac. After four days he was able to leave his bed.

CASE VI.—Vincenzo Barbara, 26 years of age, of very good constitution, married, admitted into Zeitun Hospital on Sept. 18th, 1887.

History.—Well-nourished man and good laborer; had committed for several days dietetic indiscretions; stated he was in perfect health on Sept. 17th; worked as usual, and slept well. Seized with cholera 4 A.M., Sept. 18th; in only three hours had ten discharges; the diarrhœa was not attended or preceded by colic or other pains in the abdomen; cramps occurred soon after the attack and continued without intermission. At 9 A.M., Sept. 18th, he was admitted into Hospital.

Actual Condition.—Face livid, violet; eyes hollow; pulse small and feeble; somnolent, but sleep checked by cramps; thirst intense; diarrhœa profuse, like boiled rice; vomiting intense and frequent. The patient seemed feeble to an extreme degree.

Treatment. — Injections with sulphuric ether; enteroclysm with tannic acid, quinine and carbolic acid; excitant mixture with liquor ammonia; cognac with ice.

11 A.M.—Blue color very marked; pulse scarcely sensible; painful cramps of the lower extremities very frequent; body cold; diarrhœa profuse; vomiting frequent; respiration disturbed; voice hoarse; no urine. Counter-irritation applied on the left side of of the neck.

3 P.M.—Respiration less frequent; cramps less frequent and less severe; diarrhœa continued. Counter-irritation applied again.

6 P.M.—The patient slept one hour; same symptoms, but less severe; same treatment.

Sept. 19th, 6 A.M.—The patient slept four hours during the night; body cold but not like ice; diarrhœa moderate; no urine; same treatment.

20th.—The patient passed a good night; good broth and two eggs; a dose of Marsala wine.

21st.—The patient convalescent.

22d.—Gradually improving. On Oct. 5th left Hospital cured.

CASE VII.—On the same day was admitted into Zeitun Hospital, Cornate Jarionolite, 13 years of age, of scrofulous constitution, with the following symptoms: Face, hands, and forearms bluish; body cold; eyes very hollow; diarrhœa ("rice water"), with vomiting; cramps severe, confined exclusively to the lower extremities; anæmia; pulse very weak; respiration disturbed.

Treatment.—Applied at once the vagus treatment on left side of neck; excitant mixture internally. After two hours the patient slept well, and the symptoms were less severe. She continued to improve gradually, and on Sept. 28th left the Hospital perfectly cured.

CASE VIII.—On Sept. 26th called at 3 A.M. to visit A. L——, 32 years of age, of very weak constitution; she was seized at 1 A.M. with severe diarrhœa and vomiting; I removed her at 3:30 A.M. to the Zeitun Hospital while suffering very severe symptoms of cholera. I applied at once the vagus treatment on both sides of the neck, and after four hours found the patient improving; she was discharged cured on Oct. 2d.

CASE IX.—T. C., 8 years of age, came with her mother to the Hospital on Sept. 27th with the follow-

ing symptoms:—Face livid, violet; eyes hollow; pulse small and feeble; somnolent; thirst intense; cramps; profuse diarrhœa, like boiled rice; vomiting intense; all symptoms of a severe attack of cholera in fact. I applied the vagus treatment at 7 A.M., and soon after she slept well and began to improve. On Oct. 29th she left the Hospital cured.

CASE X.—On same day L. A., 22 years of age, was also admitted into Zeitun Hospital in a very weak state, and with most severe symptoms of cholera. The vagus treatment was applied at once, and the patient improved immediately.

In his "Report" Prof. Pisani gives the clinical history of three cases treated by Dr. Inglott on the ordinary system, two of whom died and one recovered, before the adoption of the vagus treatment, the fatal cases not more virulent than those saved by the topical remedy; the favorable one proved successful only after nine days of continuous medication, and *not until tentative counter-irritation* by liniment of iodine was applied behind the ears. This instructive case is as follows:

Madalena Briffa, 23 years of age, living in No. 3 Vicoli i Strada Bazadey, came to Zabbar Hospital on Sept. 2d, 1887, at 11 P.M. A spinster, very poor, of good character and good constitution, but slightly scrofulous. Had committed no excesses; for nearly five days continually assisted her mother, who suffered from attacks of heart disease. Being poor, she had been eating only rice boiled in water and some bread. On Sept. 2d, at 6 P.M., she had a mod-

erate diarrhœa. The dejections suddenly became frequent; at 10:30 assumed a serious form, and became like boiled rice; cramps began simultaneously with the vomiting; the voice became feeble and the body cold. The patient requested urgently to be removed to the Hospital. I was called at 10:40, and gave her temporary assistance; she was removed to the Hospital at about 11 P.M.

Actual Condition.—Surface of the whole body icy cold; color of face so deep as to be almost black; the skin of the extremities singularly wrinkled and livid; voice nearly lost; the expression of countenance one of great anxiety; eyes much sunken; the upper and lower extremities affected with cramps in violent degree; cold perspiration; suppression of urine; vomiting, the expelled fluid being thrown with great violence and to a great distance; pulse imperceptible; thirst intense; great prostration; respiration difficult.

Treatment.—Stimulation by spirituous liquors; subcutaneous injection of sulphuric ether; hot bottles; frictions with spirit of camphor, and soap and ammonia liniment; enema of spirit of camphor and hot infusion of coffee; large sinapism on the spinal column; large poultice of cumin seed and chamomile to abdomen; stimulant mixture of liquid acetate of ammonia and spirit of chamomile; cognac in an effervescent mixture of bicarbonate and chloride of soda.

Sept. 3d, 1887, 12:30 A.M.—Features immovable; great prostration; eyes dull, sunken; face, including lips, livid and cold; arms and feet cold; tongue pale and cold; great thirst; complete aphonia; suppression of urine; expression of great anxiety; diarrhœa persistent ("rice water"); no vomiting; same treatment.

At 6 A.M., same condition; same treatment.

2 P.M.—Dull of intellect; face always cold; nose icy; expression of great suffering; arms icy cold; complete aphonia; no urine; hearing and sight greatly deranged. Patient suffered less from cramps after being rubbed and warmed by hot bottles; extremities warmer; same treatment.

4:30 P.M.—Same state; same treatment.

8:30 P.M.—Patient very bad; respiration disturbed; diarrhœa, very profuse; folds of skin when raised between two fingers disappeared very slowly, as in the case of corpses (constant symptom in all bad cases of cholera which ended fatally).

9:30 P.M.—Symptoms unchanged; five hypodermatic injections of spirit of camphor, two at each arm and one at the left leg; enteroclysm of cognac, ether, and spirit of camphor, in decoction of chamomile; drops of ether and liquid acetate of ammonia in hot water; frictions of ether with hot vinegar; large poultice of cumin seeds, chamomile, and mustard meal, from the upper part of chest to lower part of the abdomen; strong liniment of iodine on the spinal column.

12 A.M.—Patient a little better, but symptoms not improved; two injections of ether on the spinal column, one at the upper, the other at the lower part; enema of strong infusion of cumin seed with two drachms of spirit of chamomile.

Sept. 4th, 12:30 A.M.—Slightly disposed to sleep; purging less frequent; cramps less violent; vomited once; extremities cold; chest and abdomen warmer; respiration difficult; intelligence heavy; pulse perceptible, but very weak; speaking caused great fatigue. Ordered perfect rest, medicines to be stopped, perfect silence.

3 A.M.—Slept one hour; one stool, with slight

efforts to vomit; pulse little excited; enema and gum Arabic mucilage; a dose of bismuth internally.

8 A.M.—Slept two hours; no vomiting, no stools; pulse feeble; surface warm; comatose; two spoonsful of broth and a good teaspoonful of Marsala wine every two hours.

10 A.M.—One stool; very little urine; infusion of of chamomile and large poultice to abdomen; pulse weak; face pale; no cramps; no vomiting; expression of great weakness; eyes brighter; intelligence clear; a little thirsty; same treatment with lemonade, and Marsala (iced), every three hours.

12:30 P.M.—Vomited greenish matter; one stool; one ounce of urine since 10 o'clock; thirst less; tongue red at border and top with mucous coating; great debility.

5 P.M.—Patient complained of sounds similar to ringing of bells in the ear, which prevented her from hearing well; liniment of iodine behind the ears; respiration normal; pain at the extremity of the last rib on the right side; friction of laudanum; broth and Marsala wine.

Sept. 5th, 8 A.M.—Voice natural; urine copious; diarrhœa ceased; very weak; a few spoonsful of beef-tea every two hours; a mixture of tinct. quassia and cinchona every four hours.

5 P.M.—Felt better; same treatment.

Sept. 6th, 8 A.M.—Passed a good night, and slept very well for four hours; relished coffee; still weak; same treatment.

Sept. 7th.—The menses, which stopped at the beginning of the disease, returned during the night. Patient very weak and unable to move her arms; beef-tea, Marsala wine, two eggs.

8th.—Appetite tolerably good; voice natural;

face pale; appearance of small abscesses; syrup of hypophosphite of iron, a tablespoonful morning and evening.

9th.—Slept well; no dejections; urine very abundant; skin warm; face pale; weak; same treatment.

10th.—Improving; same treatment.

11th.—Patient out of bed and declared convalescent. Continued to improve gradually. On Sept. 19th discharged, cured, but being very poor was kept on the Hospital diet-book.

This was one of the most severe cases I ever saw followed by recovery.

The case of Madalena Briffa, was especially remarkable for its virulence, and the narration thereof exhibits in strong light the devotion of Dr. Inglott, and the fertility of resources at his command. But contrast her case with that of Carmela Briffa, 49 years of age (Case II), admitted two days later into Zabbar Hospital, whose medical history is comprised in the few words: "Admitted on Sept. 4th, at A.M. Hypodermatic injections and stimulants failing to relieve, at 2 P.M. counter irritation on both sides neck; soon after slept. Next day, Sept. 5th, 4 A.M., declared convalescent. Sept. 7th, 10 A.M., left Hospital, perfectly recovered!"

These clinical reports certainly do not call for any lengthened comment; they tell their own tale.

And now believing enough has been said to carry conviction that stimulation of the vagus is the

key to the treatment of cholera in any and all of its diversified forms, or at least that it is worthy of most careful consideration, I will say.

"*Vale.*"

APPENDIX A.

THE HISTORY OF EUROPEAN CHOLERA AND ASIATIC CHOLERA.*

This morbid affection was known in times of greatest antiquity. The Bible, in the book of Sirach, says men given to crapulation are threatened with cholera. In the *Cohelet* or Ecclesiastes, caput vi, it is written: "*Cholira est aliud malum sub sole frequens apud homines.*" And Deuteronomy, the Vulgate, chap. xxviii, says: "*Augebit Dominus plagas tuas infirmitates pessimas et perpetuas cholaim-raim.*"

[Perhaps it is needless to remark that these purported quotations are fraudulent, in that they are garbled, and further do not in any way refer to cholera; the word *Cholira* in the one instance, and *Cholaim-raim* in the other, are interpolations of the author.

The sentence in Ecclesiastes (chapter vi, verse 1), in the Vulgate is: *Est et aliud malum quod vidi sub sole, et quidem frequens apud homines*, or "There is a certain evil which I observe daily, that is frequent among mankind"—the Preacher in this instance

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* Translated from Ozanam's "Histoire Médecale Générale et Particuliére des Maladies Épidemiqués," by Thomas C. Minor, M.D., Cincinnati—Embodied by permission of the Translator.

referring definitely to *vanity*, without even a thought of gastric griefs or peristaltic woes.

Again, Deuteronomy (chap. xxviii, verse 59), winding up a threat of many evils, the Vulgate has it: *Augebit Dominus plagas tuas, et plagas seminis tui, plagas magnas, et perseverantes, infirmitates pessimas et perpetuas:* "God will multiply plagues and the plagues of thy seed, great plagues of long duration, and severe illnesses of great continuance."

The King James version gives these respectively as: "There is an evil which I have seen under the sun, and that is common among men," and: "Thus the Lord will make thy plagues wonderful, and the plagues of thy seed, great plagues of long continuance, and sore sickness, and of long continuance." —S.]

Hippocrates ("De Morbo,") cites the observation of Silenus, who died the eleventh day of an attack of cholera, coming on after hard work and excessive drinking; and, in his sixth book on "Epidemics," he speaks of an Athenian who was cured the third day of the disease.

Cornelius Celsus and Cœlius Aurelianus also speak of cholera. The latter mentions certain symptoms that are manifest in Indian cholera, such as the vomiting of white watery fluid.

But it is in Cappadox Aræteus, that true painter of diseases, that we find a very concise and clear description. "It is," says he, "an inverse movement of morbid matter which reflects on the stomach and intestines; it is a very acute affection. The materials collected in the stomach are rejected by vomiting; those carried

into the intestine are evacuated by the stools. The first vomitings are watery; the first stools are liquid, stercoraceous and infected, and at times mucous or bilious; at times the malady begins in a benign manner, without pain, but afterwards tension of the epigastrium comes on, with constriction of the throat and violent intestinal colic. As the disease progresses there is increase of the colic, mental depression, muscular contractions, and a lowered vitality. If the patient drinks there is nausea, accompanied by internal noises; bilious vomiting, with stools of the same nature; distension of nerves; muscular contractions of limbs; curved-in fingers; vertigo; hiccough; blue nails; cold extremities; rigidity of the body. If the patient grows worse, there is profuse sweating, throwing off of black bile by both orifices, spasm of the bladder, stoppage of urine, which may have been profuse before, noting the same derivation that acts on the intestinal tube; aphonia now becomes manifest; pulsation of the arteries is scarcely apparent and very rapid; there is continual nausea, and tenesmus without dejections; and death arrives in the midst of atrocious pains, convulsions, and a feeling of strangulation. This malady occurs principally in summer, rarely in winter. It attacks the young and robust individual, and the infant, rather than the old."

Diogenes, the Cynic, died at Corinth of cholera, after having eaten rare beef's foot.

Ancient physicians appear never to have observed cholera under its epidemic form; they only mention it as a grave sporadic affection of short duration, not always fatal.

It was in the sixteenth century that cholera was noticed to reign epidemically. Mezeray, the historian, reports that a colic called *Trousse-Galant* appeared in

France in 1528 and prevailed until 1531, the epoch when the horrible plague of which it was the precursor ravaged Europe.

Alcmarinus Forestus ("Observationum et Curationum Medicinalium," liber 18) describes epidemic cholera as it prevailed at Alkmaert in 1548. This outbreak was characterized by vomiting and dejections of an aqueous, limpid material, followed by general prostration, cold sweats, syncope and death. This epidemic ravaged Delft at the same time.

Lazare Riviere ("Observationes Medicæ et Curationes Insignes," etc., liber 26, Lyons, 1680) remarks: "In the year, if I be not mistaken, 1645, before the plague attacked Nimes, there came a disease called cholera, killing many patients in four days; nevertheless, those who sought medical advice at the commencement of the malady almost all escaped by this method: Patients drank little; they were given quince jelly and their limbs rubbed with aromatics; embrocations of oil of chamomile, heated, and topical applications of aromatics on the epigastrium, were used; cordials were administered, and astringent opiates with rhubarb and clysters."

The most celebrated epidemic of ancient cholera was that which prevailed in England from 1669 to 1672. Thos. Sydenham has left an excellent description of this outbreak; he was himself attacked while suffering from gout.* The following is his sketch of the malady:

"It was at the commencement of August, 1669, that the plague started in London. This malady was easily recognized by the continual nausea, enormous

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*See page 7.

vomiting, black and fœtid stools difficult of emission; atrocious pains in the intestines, tympanic distension of the abdomen, cardialgia, irregular and accelerated (sometimes feeble) pulse; heat and dryness of the skin, colliquative sweats, intense thirst, contraction of the limbs, sadness, cold extremities, and other symptoms that were much more serious and that were often the fore-runners of death, in the space of twenty-four hours. It also showed itself under the dry form, with colic, without vomiting or stools. Hippocrates ("De Ratione Victus in Acutis," liber 11) and several other authors of ancient times, have observed a similar complaint. It is characterized by abdominal tympanites and flatulence at the upper and lower orifices."

It was at the commencement of August that Sydenham observed the malady at London, and, as before stated, it was easily diagnosed by the great vomiting, continual nausea, etc. Sydenham observed that purgatives aggravated the disease, while narcotics and astringents prevented the exit of excrementitious matter, and hence were dangerous. He sought a new method of treatment by aiding the evacuations by diluents, such as chicken broth and skimmed milk; he gave clysters of decoctions of lettuce and water lily, and also used syrups in drinks. After using these for two or three hours he terminated the treatment by a calmative potion, with a little laudanum. When the physician was not called in until after ten or twelve hours, at the time when the patient, owing to repeated vomiting and purging, was exhausted, he prescribed laudanum immediately; this was continued morning and night, notwithstanding the cessation of the evacuations, up to such a time as the patient had recuperated his strength.

This epidemic only lasted during the month of August in that year.*

During the following years, 1670, 1671, and 1672, the same epidemic prevailed in London; it tended towards dysentery in character, and of which it was often a degeneration. It attacked by preference the young of hot or bilious temperament. The intestinal pains were atrocious; the patient appeared constricted as by a strong girdle, or pierced by some sharp instrument. These pains diminished little by little from time to time, but only to recommence with renewed violence. During the paroxysm the patients' countenances were distorted, and they uttered lamentable cries. The vomitings were not very frequent, and constipation readily yielded to cathartics; but, pains, from the first erratic, fixed upon one point. During the progress of the affection the vomitings increased, the belly was contracted, and the peristaltic action of the bowel became totally inverted; from them iliac passion declared itself, clysters and excrements were emptied by the mouth, admixed with greenish, yellow, and other curious colors.

The treatment consisted in general bleeding, three or four times after anodynes; the next day a mild cathartic, which was repeated, after a day's interval, three times, according to the abundance of the humors, that were diluted by drinks such as milk and beer. In the iliac passion cathartics were useless, and were only employed among subjects whom one knew to be easily relaxed; in such cases some mild laxative, such as tamarinds, senna, rheu-

* I fail to see a picture of cholera in either this or the subsequent description.—S.

barb, or syrup of roses, were used. If patients could not stand liquid medication, resort was had to pills. But if the stomach still refused, treatment was commenced by prescribing an anodyne potion, and a cathartic a few times after; then repeated the first remedy morning and evening, up to such a time as the pains disappeared. Carminative lavements (injections) carried the trouble into the intestinal system, and made the disease more rebellious. The diet was light, composed of barley cream, and panada; later a little chicken and fish were allowed. The drink was milk or light beer diluted with water. For patients of wealth, horseback exercise was advised to recuperate the strength.

The following observation by Dr. I. Frank, of Ulm, made in the years 1695 and 1696, is curious and valuable:

"In the year 1695 the winter was very cold; a dry freezing spell lasted until almost spring-time. Then suddenly came rains and unhealthy fogs, and almost all children had violent coughs. In the month of May measles appeared; this disease prevailed until July, when it became complicated with diarrhœa. August came in cold and rainy. The prevalent diseases disappeared towards the equinox of autumn, but at the commencement of October a new epidemic, *i.e.*, bilious colic, became manifest; this malady was accompanied by fever, constipation, terrible pains in the abdominal region, with cruel spasms that started at the loins and extended to the umbilicus. These spasms only ceased to renew themselves. The belly was retracted, becoming concave like that of certain hysterical women. Sometimes the pains were felt deeply seated in the right hypochondrium, at the spot where the pancreatic duct and ductus choledochus

are inserted into the duodenum. Vomiting occurred from time to time, caused by the spasmodic contractions of the colon, or convulsions attacked the limbs, degenerating into contractions and paresis. This disease prevailed especially among men given to drink, and women were not spared. One knew not whether to attribute the malady to new wine made from unripened grapes, to the variations of the atmosphere, or to some terrestrial conditions."

The following is an example of the affection:

"A literary man, aged about forty years, of delicate constitution and habitually constipated, experienced pain in the loins, with frightful colic. He was put to bed and took heated remedies in order to provoke sweating, but received no relief; on the contrary, the colic was increased, to his great prostration, and he had a pain in the dorsal region corresponding to that in the gastric and umbilical quarters; this pain extended to the hypochondrium, descending to the perineum, going back into the belly again and retracting the navel; sometimes it was all over the abdomen, including the scrotum. The sixth day two injections were given him, with a decoction of veronica (*toad flax*), with a laurel electuary and Hannes confection — that which quenched the pains; the patient also took peppermint water. He recovered in a few days. Veal soup flavored with anise seed was employed with success, but purgatives aggravated the malady."

In the year 1695 Jean Jacques Schaller, of Basle, gave the history of a similar malady that prevailed epidemically in Switzerland, and was attributed to the bad quality of the wine. An obstinate constipation was manifest, with vomiting and loss of appetite, constant nausea and eructation, prostration and lassi-

tude, accompanied by a little fever; thirst, wakefulness, convulsions, and painful ischuria were the principle symptoms of the disease. The affection was treated with oily injections of sweet almonds and Spanish wine, with tincture of castor and syrup of peppermint, two spoonsful of the mixture every three hours. Infusion of chamomile and mint, with syrup of poppy and orange peel, were also employed. The treatment was terminated with a light solution of manna or cream of tartar in chamomile water; stronger purgatives were injurious.

Towards the close of 1717 the inhabitants of Pegau, in Lower Saxony, were attacked by epidemic colic, with the following symptoms: Light chill, followed by intense fever and great thirst, bilious vomiting, acute pains in the hypochondrium, tension in the præcordial region, violent cough, hiccough, the latter principally among pregnant women; difficult respiration, feeling of weight at the diaphragm, face becoming sub-icteric; the urine, clear at the commencement of the malady, grew red and sedimentary towards the decline; the pulse was rapid; a painful constipation, or frequent alvine dejections, persisted during the whole course of the disease. Bleedings and febrifuges were so injurious that suffocation, delirium, and death, invariably followed their use; refrigerants and light laxatives always cured the patient on the fifth or seventh day.

Antoine Augustini, of Venice, speaking of the epidemics of the year 1741, states:

"Through the Venitian States that summer a violent epidemic of colic prevailed. The attacks commenced with great præcordial anxiety, feverish pulse, dyspnœa, flatulence, acute pains in the bowels, and constipation. The malady passed promptly into

a tympanitic condition, or degenerated into dropsy or dysentery, and, if not promptly treated, old persons when attacked died. Light bleedings, the application of leeches to the hæmorrhoidal veins, clysters, and emollient drinks, were the most appropriate remedies to be used in the disease."

The "Memoires de l'Academie des Sciences de Paris" are full of observations on epidemics of in Paris. The learned Dr. Malouin writes:

"Cholera morbus suddenly appeared in Paris in the month of July, 1750, and soon became epidemic. It had at first the aspect of hepatic colic, owing to the pain the patients experienced in the neighborhood of the liver; but the patients were not jaundiced, however, and their excrement was not white. Many patients succumbed the third day, especially if the colic was accompanied by indigestion. In general, the face was drawn and the patient hollowed-eyed, especially when vomiting was present. The pulse was rapid, but compressible; the belly was distended; constipation was obstinate, with pains in the hypochondrium and lumbar region. Bleeding seemed to aid some of the sick by diminishing the convulsive tension of the abdomen; afterwards emollient drinks were employed, and tepid water, with chicken broth, followed by light purgatives; and the cure was terminated by the use of Vichy water."

Dr. Lentin has left on record the history of an epidemic of so-called European cholera that occurred at Dunaburg in 1765:

"For several years we saw prevail a sporadic form of epidemic cholera that attacked a large number of persons. There was a right lateral pain, with cough, in this affection, with sanguinolent expectoration, accompanied by febrile heat; but this morbid affection

soon changed its character, for a chill came on, followed by severe pain in the left side, with præcordial anxiety, nausea, vomiting, and headache. The fourth day there was high fever, with thirst and very dry mouth and pain in the throat; the disease now invaded the abdomen; there was obstinate constipation, frequent belching, which provoked regurginous vomiting, and then degenerated into a putrid diarrhœa with tension of the abdomen; the pulse became feeble and compressible; the urine was sour; there was often great pain present, and even tumors at the articulations; these latter were almost a sure indication of near death. As to treatment, the patient was bled, and powders of nitre and camphor, with decoctions of oats, emollient clysters, and laxatives, given. Bladders full of hot milk, cataplasms of mallow, and sometimes blisters, were applied over the seat of pain. When the diarrhœa became fœtid, camphorated quinquinia was given."

In the month of July, 1766, an epidemic of bilious colic, complicated with cholera, prevailed in London, and is described as follows by Dr. Sims, in his "Observations on Diseases."

"Women were more frequently attacked than men. Sometimes the invasion of the disease was sudden, at other times it was preceded for two or three days with depression, and if at the commencement of the malady we used lemonade as a drink, freely given, or something that gently acted on the bowels, the malady was frequently cut short. If there was a bilious congestion of the alimentary canal, the pulse was small and intermittent."

In May, 1779, cholera morbus broke out in Fougeres, in Brittany, and attacked principally peasants and English prisoners of war. This epi-

demic prevailed until October, but reappeared the following spring. The symptoms were violent pains in the entrails, heavy weight in the epigastrium, nausea, vomiting of bile, acute pain in umbilicus and sometimes in kidneys. There was ordinarily constipation and red urine, with bitterness in the mouth and retraction of the umbilicus. The alvine dejections were bilious, usually preceded by hard lumps of matter resembling sheep's dung; there were large quantities of bile in the vomit.

The so-called European cholera often declares itself on vessels in tropical regions; this disease almost destroyed the Australian expedition that sailed from Trieste in 1821 to make the tour of the world, and was commanded by Baron Schimmellpening, who was one of the victims, as well as the captain, and the famous botanist, Bohun.

The Asiatic cholera is an epidemic malady in India and other equatorial regions, and from thence spreads to Europe and other portions of the world.

Its synonyms are: *Sitanga* or *sinanga* (Sanscrit); *Ho Louang* (Chinese); *Morxi* or *mordechi* (Indian); *Ouebb* (Persian); *Hachaiza* (Arabic); *Haoucha* (Armenian); the *griping disease* (Indo-English); *Braal Loop* (Dutch); *Cornaja Coleza* (Russian); *Cholera spasmodique* or *Trisplanchnite* (French).

Cholera, since times of antiquity, has prevailed in Asiatic countries under its sporadic form, seldom becoming epidemic; but suddenly, in 1817, it assumed this latter shape and invaded the banks of the Ganges, advancing from the southeast towards the south and northwest, covering two continents with the veil of death. In its immense flight it covered one hemisphere and then the other; it hovered over each country in turn, and, like a vulture, seemed to fly in cir-

cles, marking in advance the scene of its devastations; then suddenly, with the rapidity of lightning, it immolated its victims by the thousands. English physicians in India, like Dr. Tytler, have observed that the cholera always exercises its fury upon the frontiers of a province before going to the interior. Happy would it be for humanity if, like the plague, cholera were contagious (it has been proved that it is not); it would be easy then to preserve ourselves from its ravages; but its genesis, purely epidemic, renders it a thousand times more disastrous and uumanageable on this account.

The march of cholera has given rise to the following reflections, that we submit before tracing the further history of the Asiatic plague:

Great movements of the physical phenomena of the universe are made from east to west, such as the moon, stars, the rise and fall of the ocean tides, while the Earth makes its revolutions in a contrary sense. The human race had its birth in the Orient; it propagated from east to west, from the borders of the Euphrates to the western rivers. Thus the first children of Earth peopled India, Africa, and Southeastern Europe. In the ages following, the Scythians and Tartars crossed the Oural and Caucasian Mountains to populate Russia, Turkey, and the borders of the Black Sea, and other of the larger water-courses of Europe. From thence came the Huns, Lombards, Vandals, Swedes, Germans, Gauls, Goths, and Vis-Goths, while the Bourguignons settled themselves along the Danube, Rhine, and Northern Ocean, overflowing this territory like a flood. Later the Moors, coming also from the Orient, established themselves in Spain, while the Normans invaded Western Gaul, and the Saxons Great Britain. In more modern

times we saw the inhabitants of Europe going west to found colonies in America. Finally, all outbreaks of barbarians have been from the Orient to the Occident.

All religions have followed the same march, such as Judaism, Christianity, Islamism, and even the schisms of these churches.

The same march is held by epidemics: the plague, small-pox, measles, and leprosy, were brought from Turkey and Syria by the Moors, Jews and Crusaders who were chased out by the Caliphs. The Black Plague of the fourteenth century started at Katai, in China, and only ceased on the borders of the ocean. The catarrhal epidemics of 1239, 1311, 1323, 1400, 1427, 1557, 1580 and other occasions too numerous to mention, called "*The Russian*," "*The Muscovite*," "*The Influenza*," "*The Dando*," "*The Coquette*," etc., all came from Northeastern Europe, and only ceased on reaching the borders of the Atlantic. Typhus came from Hungary in the sixteenth century, and was called the "*Hungarian Fever*." Finally, cholera came to us from the eastern borders of China and India. We might cite numerous epidemics, notably that of 1814, which followed the same course. No epidemic ever originated in the West or New World; and though it is claimed that syphilis and yellow fever came from there, the proof of this statement is wanting; these two diseases are not epidemic, nor are they the product of atmospheric influences, but are due rather to a contagious virus as regards the first, and to infection in matter of the latter.

Cholera is a purely epidemic malady, carried by the atmosphere, following currents and oscillations of the air, just as it goes up against the courses of rivers. We do not know why this plague was called cholera

or cholera morbus, as it does not correspond with the disease we have described, for the bile plays no part in the affection; the name probably arose from a few symptoms these diseases had in common.

Let us now enter into a brief history of what is known by moderns as

ASIATIC CHOLERA.

We shall only trace the history of this pestilence from 1817 until a more modern date. We shall note the frightful rapidity with which it spreads and the painful disasters it has inflicted on the Old World, as well as America. We have before spoken of cholera morbus, as it was called in Europe; we are now dealing with the disease that is endemic in India. Sanscrit works describe this disease as existing from time immemorial. It was known to the Arabs, and prevailed in Europe as an epidemic as early as the sixteenth century.

Alexander of Tralles ("De Arte Medica," liber vii, cap. 14) speaks of cholera with vomiting and white liquid dejections; while Cœlius Aurelianus (lib. iii, cap. 20) also remarks: "*Crescente passione aquati ac tenuis liquoris fit egestio et aliquando similis loturæ carnis. Feruntur etiam cum his humoribus plerumque sub albida desputa,*" with other symptoms of cholera.

But Jacob Bontius was the first European physician who mentions the disease, over two hundred years ago, in his work entitled "Medicina Indorum" (cap. vi), in the following terms:

"*Fit itaque cholera cum materia biliosa et retorrida ventriculum et intestina infectans per gulam simul ac per anum continno ferme cumque magna copia reficitur. Morbus est acutissimus Ideoque præsentis eget remedio,*" etc.

They employ, continues Bontius, astringent drinks, and a certain fruit juice called billigbing, or the syrup of lemon.

About the same period Zactus, of Lisbon, gave the following simple notice of the epidemic that prevailed in Europe in 1600:

"*Anno 1600, quando hæc pestifera lues Europam fere totam oppreserat, obsevavi plures qui hoc diro dolore affecti venenosis symptomatibus excruciati, occubiere omnes; nullus quartum diem pertransivit,*" etc.

[It was described by Garcia d'Acorta, a physician of Goa, in the first book ever *printed* in India. —S.]

Dr. Englishman ("Bibl. Britan.," April, 1830) reports that the Chinese have observed this disease in the Celestial Empire for ages, and term it *Ho Louang*. It was a Chinese medical writer, Vang-chou Ko, who described the malady long before it assumed its epidemic character in India.

This disease ravages the coast of Coromandel and the Maldivh Isles, and all the borders of India, especially during the hot summer months, succeeding the season of monsoons, when the winds of the southwest, charged with the humidity of the Pacific Ocean, suddenly lower the temperature twenty-five or thirty degrees in a few hours.

It was only towards the end of the last century that physicians and European naturalists collected observations of Indian cholera outbreaks. Paisley described that of Trincomali in 1773; Somerset that of Coromandel in 1774 and 1780; while other observers have written of that in the Isle of Mauritus in 1775 and that of Calcutta in 1781.

[Sonnerat as long ago as 1768–71 described an

epidemic in the neighborhood of Pondicherry—Presidency of Madras—that destroyed 60,000 lives and was undoubtedly cholera. The malady prevailed also in what was then French India in 1780–81, and there are reports of it in Madras from the year 1774, '81 and '82, as well as earlier, and later accounts from other parts of the East Indies, all of which describe its exceeding fatality.—S.]

Dr. Levington, who was in Bengal at the time of the famous outbreak of cholera, asked a Chinese physician for information as to the disease, and the latter showed him a Chinese medical work entitled "Teching-Tchu Tching-Ching, printed in 1790, which describes the malady as follows:

"The *Ho Louang* comes on with a sudden pain in the heart and belly, accompanied by vomiting and 'rice-water' discharges; the patient is cold and lacks animal heat and there is headache and vertigo. When the disease attacks the heart the vomiting is the first symptom manifested; when it commences in the abdomen there are 'rice-water' discharges, coming on with great frequency; when the heart and intestines are both attacked at the same time, then vomiting and frequent stools are simultaneous. When the disease is intense the patient has spasms that, extending over the abdomen, promptly induce death."

Levington translated this in the month of June, 1817, when epidemic cholera prevailed throughout all the valley of the Ganges. The type of the disease then prevalent in India, as described by him, was as follows:

"The attack is sudden and obstinate. A man laid down at night feeling perfectly well; soon he felt a painful sensation that he could not attribute to any

general visceral lesion. I saw similar cases at Macao, in China; entire families would retire perfectly well at night, were suddenly attacked by the disease before morning, and, perhaps, all dead before the next day at noon. The first symptoms are soon succeeded at irregular intervals by ardent heat in the region of the stomach, vomiting, and frequent stools similar in character to a decoction of rice. Cramps in the fingers and limbs gradually invade the body. Finally, the muscles of the chest and abdomen complete the circle of spasmodic movements, and continue until vitality is entirely abolished by death. In the last period of the disease to be seen, the vomiting and spasms often cease, owing to the complete exhaustion of the physical forces. The observing physician may often predict an imminent attack of the cholera, by the stretched out and anxious depressed air of an individual supposed to be in a state of health. The changes experienced by the pulse and skin at different periods of the disease are very remarkable. The pulse at the start is rapid, small, feeble; during the paroxysms it becomes imperceptible in the limbs, or disappears some time before death. The circulation seems extinguished in the superficial tissues; the blood accumulates in the internal organs and congests them; these viscera are found gorged with thick black blood, which explains the alteration of the organs of respiration and the secretions. At the commencement of the disease the skin is pale, cold, and covered by a viscid sweat, resembling the feeling of a frog just out of the water. At later periods, in fatal cases, it becomes altogether cadaveric."

It was at Jessora, a town situated at forty leagues [Jessur: sixty-seven miles instead.—S.] north-west of

Calcutta, that cholera for the first time in its epidemic form appeared—on August 9th, 1817.

[Though the first real, world-famous pestilence dates from Jessur, in 1817, Von Hirsch has proven the existence of other cholera epidemics in India as early as 1816, and in the first months of 1817, so that it is probable that it found its way to the region northeast of Calcutta from the Northwestern Province. It was at Jessur, however, that it first began to excite the attention of the authorities on account of its general and wide-spread extent.—S.]

Dr. Tytler,* an Englishman, first observed it; he thought the first patient he saw was dead from poisoning. The disease was attributed then to unseasonable weather and bad rice. The cholera had already appeared, in the month of May, at Nudday, and spread over the country between Sillhet and Monghir, and from the mouth of the Ganges to its confluence with the Jumna. The natives were astonished at the manner in which it was propagated; it described a perfect circle around one province without entering its interior; then it subsided in such a way as led people to think it had exhausted its force. Suddenly it returned, several weeks, and even several months afterwards, and ravaged the whole interior of the country. It was noticed to go up and then descend again one of the branches of the Ganges, then suddenly to stop, cross the river and devastate the opposite bank.

Cholera was epidemic in Calcutta for the first

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*"On Morbus Oryzeus," etc., Calcutta, 1820.—S.

time in September, 1817, but did not reach its acme until the following year. Two thousand persons died weekly in Calcutta out of a million of population.

On November 9th, 1817, cholera attacked the camp of the East India Company upon the right bank of the Betwa, [Sindh.—S.] traveling from the east to the west. It made such terrible ravages among the ten thousand English and eight thousand native troops that the vast majority only survived a few moments after being attacked; those who lived on vegetables died first. Strange to say, women and children escaped. The disease suddenly ceased when the army crossed the Betwa. Nine thousand soldiers died in the camp in ten days.*

The cholera then extended largely over almost all of India, ravaging successively the villages of Nagpur, Aurungabad, and Ponany, following the movements of troops.

Cholera struck Bombay on August 11th, 1818, and in six months 1,133 persons died of the disease. In the month of September, 1820, in the same city, following a heated term, 235 persons died in five days from the disease.

In March, 1818, it traveled—always from east to west—to Allahabad, at the confluence of the Jumna and Ganges; it was carried to Delhi, Jajpur, and into a camp of fifteen thousand troops; it carried off by preference the poorly nourished, and such domestic animals as camels, goats and dogs. The epidemic went back to the sources of the rivers entering into

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* This is liable to misinterpretation. As a matter of fact some 8,000 Sepoys *and camp followers* died, but only 764 of the English soldiery.—S.

the Ganges; it thus spread to the western or Malabar coast and to the coast of Coromandel, and marched without stopping both north and south.

It was seen at Nellur in October, 1818; at Madras in January; at Pondicherry, Carwar and Bellary in June following. In January, 1819, it was noticed at Manaar island [off the coast of Ceylon, which latter island had been attacked the previous year.—S.] Its invasion was sudden and its irregular propagation seemed to have no connection with the variations of temperature. At the same time cholera appeared at Ceylon it struck towards the east, to Aracan, Malacca, Singapur, to the Islands of Penang and Java, and returned to these places in 1821, proving very murderous.

On October 18th, 1820, cholera attacked Canton and Manilla with great fury; it came on following a terrible storm; it afterwards visited [Cochin-China.—S.] the Celebes group, and extended to Amboyna and Macassar, where even cattle, monkeys and dogs perished from the malady.

In the month of February 1821, the effects were felt at Surat, then upon both banks of the Indus; then in Arabia,at Muscat, Mosul, Bender-Abbas, and Basra, [in which latter city nearly one-fourth the entire population succumbed to the malady.—S.]; from thence up the Euphrates, and at the end of August it had reached Ispahan, Shiraz and Baghdad, and slain ten thousand persons. Here it was given the name of *Haouwa*, which means "the tempest." The Persian army, camped between Baghdad and Kurdistan, lost two thousand men. Vessels at sea were devastated by the affliction.

At Colapur [Umrawutti District,India.—S.], sixty persons embarked to cross the stream and were

attacked on the trip; only three had the strength to reach the other shore; the rest died.

The disease was in such a violent form at Muscat that those attacked *often died in ten minutes.*

[It was especially destructive in Borneo and Java; the island of Java is said to have lost 100,000 inhabitants by its ravages, and Batavia alone over 17,000. In this year (1821) cholera covered a space of forty three degrees in latitude by seventy in longitude.—S.]

In 1822 the cholera reappeared in Java; at the same period it gained Mosul in August; Mardin in September; in October Karum; in November Beru, Aintab, and Aleppo, extending into Syria and up to the frontiers of Egypt.

[This same year India was again attacked, but the ravages were less severe in the islands. In Mesopotamia it appeared with renewed intensity, and Syria was soon seized upon. It spread also in Persia, and from Ispahan reached Kazan in July, Tauris in September, and soon after Erzerum.—S.]

On June 10th, 1823, it declared itself at Latakia, and on the 20th at Antioch; here, for the time being, it terminated its cruel excursion. [It also attacked Tripoli, in Syria, and in Palestine penetrated to the foot of Lebanon. In this year also, Orenburg, on the extreme boundary of Europe, was attacked.—S.] In the countries thus invaded death usually occurred in two hours. All human aid was useless; it was only towards the end of the epidemic that a certain number of patients were saved by copious bleedings, hot foot-baths and medicinal decoctions.

Towards the end of August, 1821, when the epidemic had devastated Baghdad, it grew murderous at Shiraz; persons walking along the roads would fall and expire as though struck by lightning, without having time to even complain of illness. Workmen died with their tools in their grasp, farmers fell at their plows, and priests died while at their prayers.

From Shiraz the disease went north, passing to Zenjan and Magen; from thence eastward to Yezd. It ceased to prevail with cold weather, but reappeared the following spring, ravaging Ainad, Kashan, Kum, Kurum, Susa, Khoi [all cities in Persia.—S.]

In summer it came to Tebris, where it prevailed until winter; but in the following spring struck the frontiers of Russia. In May it was at Serachs on June 17th at Lenkoran, on the Caspian Sea; it then returned to Kur and reached Baku, a town of thirteen thousand inhabitants, where there was a festival, with much dissipation; here thirteen persons died on the public square. Three dropped while conversing on the street, falling in convulsions, taken with nausea, cephalalgia and vomiting; these latter symptoms were more formidable than spasmodic accidents. Those individuals who fasted had most chance of recovery. Treatment was necessary at the very commencement of the attack; patients were stripped in the streets and submitted to massage and cold affusions; the limbs were subjected to strong frictions; the body and chest were rubbed as well as the cramped limbs. This massage was kept up for two or three hours, a dozen persons sometimes relieving each other over one patient. Fresh water was poured on the body; then the sick man was put to bed and made to take hot tea until sweating was induced, when the patient

was considered out of danger. For several days after the attack the convalescing sick were dieted.

In the month of September the cholera reached Astrakhan and Krasnoi-Yar, killing seven-tenths of the dogs; then it passed to Calcutta and Madras again, to the Island of Java, to Pekin and Han-Kow. The preceding year it had entered China as far as the Siberian frontiers. It reappeared in Orenburg in 1828.

[In 1824, '25, and '26 the malady made little progress. Says Lebert: "The two threatened divisions of the earth, Europe and Africa, had yet (for the most part) been spared, and toward the close of the year 1826 the hope was cherished the epidemic was near its end; but as early as the beginning of 1827 it appeared with renewed intensity in Calcutta, and here it is mentioned many animals showed the influence of the disease." In India it was a popular belief that the prevention of human sacrifices had excited the anger of the gods, and it is a fact worthy of record that the wife of a Hindu in Palcala resorted to every device to obtain permission to violate the law by being burned upon the funeral pyre of her husband, who had died of cholera. She maintained she had done the same thing four times already in previous states of existence, and that, if she might repeat it for the fifth time, the epidemic would cease within a fortnight. The consent of the rajah was finally obtained, but the ashes of the poor creature failed to stay the plague. The Coromandel coast suffered again, severely; Lahore, Kashgar, and Kabul

were ravaged, the disease spreading to the high mountains that constitute the foot-hills of the Himalayas, and thence to the regions about the Aral Sea. —S.]

In 1829 it passed over Persia again, and prevailed along the Caspian Sea, to Teheran, thence to the Provinces of Mazanderan and Shirwan; it appeared, too, at Tarsüs and in the Caucasus, penetrating to Tiflis. On August 8th, 1829, many religious ceremonies occurred at this place, which favored the propagation of the epidemic; out of a population of forty thousand, five-eighths perished. From Tiflis it went to the shores of the Caspian Sea, and reached Astrakhan again on July 31st, 1830, seven years after its first appearance there; the deaths in this Province were twenty-one thousand.

It traveled up to Volga and Don and the Emba and arrived at Moscow on September 28th, crossing from Nijni-Novgorod, having traveled over three hundred and fifty leagues in two months, and ravaging the Cossack country, the borders of the Black Sea and sea of Azov, as far as Taganrog, Sevastopol, Nikolaiev, Kerson and Odessa. The following winter it traveled slowly along the banks of the Danube. Cholera devastated Moscow from September 28th to October 30th; there were 5,960 persons attacked, of whom 2,549 died.

In 1831 the cholera broke over the Government quarantines, traversing Transylvania and Hungary, from thence entering Poland and Galicia; it declared itself at Broda, a city of thirty thousand inhabitants, of whom twenty-four thousand were Jews; here seventeen hundred cases occurred and eight hundred patients died. In Galicia, from June 1st to August

8th, 86,687 persons fell sick with cholera, and of this number 24,600 died. In Hungary there were 19,175 cases and 8,266 deaths.

During the summer of this year the disease continued to travel north, arriving at St. Petersburg and Archangel, then descending on the coast of Finland.

It appeared in Prussia on August 18th, and Berlin and Stettin; from thence it went to Vienna, where it ravaged the suburbs before penetrating the city proper.

Finally, in 1832, the cholera crossed the Rhine, was carried to England, then threw itself with fury on Belgium and France. In Paris it lasted from March 22d, until the commencement of August, and killed 26,300 victims; thirty physicians contracted the disease, of whom eighteen died. In France, during this epidemic, 229,534 persons fell ill with the disease, of whom 94,626 died.

[Here may be left the history of M. Ozinam, and the tale completed by Lebert, who is much more thorough and accurate, and further, much more familiar with the ravages that overtook Europe.—S.]

The year 1830 witnessed a new phase in the dissemination of the epidemic which, from this time on, possessed the greatest interest for all Europe. It was now, relatively, not very severe in the English Indies and Eastern Asia, but its advance towards the northeast was more positive than ever before. It soon again extended to the coast of the Caspian Sea, and Orenburg, which had already been reached in the last months of 1829, was again attacked. Almost a tenth of the population was now seized with cholera, though the number of fatal cases—scarcely a fifth of these

attacked—was usually small. From this place it spread all over the neighborhood, and now the high places and mountain regions were very severely visited. In spite of isolation and quarantine the epidemic appeared in Nijni-Novgorod in the month of August. It had already been creating havoc in Persia since May, and now Teheran was seized upon, then Tauris again, where it was exceedingly severe. From Tauris it soon reached Tiflis, where, although the majority of the population had fled, the fourth part of those that remained fell victims; I may say however, that I do not attach much importance to any of the numbers given.

The Caucasian mountains now no longer formed a wall against the progress of the disease, as it attacked the higher regions, overleaping the mountain chains in several places, and as a general thing followed the course of streams. Towards the middle of July it again traveled from the Caspian Sea to Astrakhan, where it was not only much more destructive than before, but showed again a definite tendency to spread in the direction of Europe. It now followed the regions along the Volga, over a wide extent of territory, and in a few months reached 130 leagues northwest of Astrakhan. Kazan was now soon, but lightly, attacked. The epidemic spread also along the tributaries of the Volga. Besides this northern excursion, a western one soon showed itself. The territory of the Don was seized upon. The pest also reached Azov and Saratov, where many chickens perished also, in their yards. Somewhat later the disease visited the coasts of the Azov and Black Seas; among other cities here, Sevastopol and Odessa were attacked. The cholera now followed up the Dneiper, reaching Nijni-Novgorod and Kiev in October, and

extending in November to Podolia and Volhynia. From still another side it penetrated into the heart of Russia. From Saratov it advanced, after again overleaping the sanitary regulation lines, to Moscow, where it raged with great intensity from October to April of the next year. The destruction was exceedingly great in this city, but it was considerably lessened by the presence of the Czar, who came over from St. Petersburg and visited the patients in person, providing proper arrangements for their care and comfort.

In 1831 this fearful pestilence excited still further the apprehensions of Europe. It first appeared again, however, in the spring in the Orient, especially in Mecca and Medina, and raged with great violence. Over 100,000 pilgrims were assembled in the two cities when the disease broke out, and here again we observe that all crowds, under these circumstances, are particularly dangerous. Soon afterwards the cholera showed itself in Syria, and Egypt; it appeared in Alexandria, but it was especially in Cairo that it created unheard of destruction: 30,000 people are said to have perished here in the first months. Though Ibrahim Pasha believed himself safe by having surrounded his court and harem with a triple *cordon*, many of the inmates were attacked. In Egypt the disease penetrated up the Nile to the higher regions of the country. Constantinople was also attacked this year, though but lightly, while Smyrna was seized upon most savagely.

In Russia, the pestilence still raged, not only in the south, but also in the north, as far as Archangel. Finland, Esthonia, and Livonia were visited, and St. Petersburg attacked with especial severity. Notwithstanding the presence of the Czar in the capital, a

popular revolt was excited, caused really by senseless restrictive regulations, but was soon quieted. The central region of the Russian Empire was also sharply seized upon, and from the south the pestilence spread out westward in two lines, south-westwardly towards Moldavia and north-westwardly towards Poland. In the first mentioned land Jassy in particular was severely attacked during the summer. But the north-western extension of the disease was far more dangerous. It stretched out southwardly from the borders of Poland towards Galicia, where Broda and Lemberg suffered severely. To the north it reached Brzesc and Grodno. Warsaw was now soon visited, and the Prussian border was over-stepped for the first time at Kalisch. At Cracow there were many victims. Prussia was now attacked from the other side. From Riga, where no less than one-twenty-sixth of the population perished, it passed on to Mitau; soon it showed itself in Dantzig. From this place it entered Elbing, Marienburg, Tilsit, and Königsberg. From Poland it passed to Silesia and to the neighboring countries, Bohemia and Moravia. Following the course of the Oder it reached Küstrin and Frankfort, and now spreading itself out over the regions of the Havel and Spree, on August 30th entered Berlin. I was myself present during the entire four months of the stay in this city. The mortality was not very severe, in all some 2,500 among 200,000 inhabitants. Fear of the disease was not great in Berlin, on account of the cheerful disposition of the people. Caricatures were even published with incredible frivolity in ridicule of the hypochondriacs who could not collect together sufficient protectives against the disease. It was at that time that there appeared the well known cartoon upon Rust, the contagionist, who had at-

tempted to secure the isolation of the sick by a great sanitary *cordon*.

The cholera disappeared from Berlin at the end of the year 1831. It was observed in North Germany, at that time, that chickens and pigeons, and in many rivers fishes, perished in great numbers. It was an interesting fact that the greatest number of persons were attacked on Tuesday, the least on Saturday, which is clearly to be attributed to the Monday excesses of the laboring classes. In October of the same year the disease appeared in Breslau, and soon spread all over Silesia. It raged exceedingly severely in Hungary, and Vienna suffered also in this year from a widespread though not very fatal epidemic. The course of the disease along the territory of the Elbe attracted attention. Among the cities here attacked were, successively, Magdeburg and Hamburg. The more western extension took its departure chiefly from Vienna. In North Germany, although the disease was very widespread, it shared the territory along the course of the river. The Scandinavian countries were perfectly exempt from attack, excepting a light epidemic in Stockholm, which reached the city through Finland in the westward march of the disease from St. Petersburg. From Hamburg it overleaped the sea, and on Oct. 26th, 1831, reached Sunderland, on the east coast of England. Soon now it spread itself over the islands of Great Britain. London was attacked in January, Edinburgh in February, and Dublin in March, 1832. From England it was carried over to France, just as later, in 1849 and 1853. In March, 1832, it showed itself in Calais and Paris. It excited the greatest terror in Paris, where it raged with extraordinary intensity, destroying about one-forty-third of the whole population. Here, too, it

excited a dangerous popular revolt. The people complained here, as in many other places, that the wells had been poisoned, and this caused the greatest mortality. From Paris the disease spread out northwardly. On the northwest it passed into Brittany, some 120 hours' journey distant from Paris, while its southern radiation scarcely exceeded 30. A new phase in the epidemic presented itself towards the middle of the year 1832, when the cholera crossed the Atlantic Ocean and appeared in North America, with especial violence in Canada. It was very severe in Quebec and Montreal. New York was attacked as early as July, and shortly thereafter Philadelphia and Baltimore in succession. The epidemic ran through the country as far as New Orleans, which was reached in November, 1832, and in the summer of 1833 it invaded the Mexican States. Here it was most severe in the cities of Vera Cruz and Mexico. This epidemic, many particulars of which I have received from several practitioners, was not only very destructive, but was most remarkable from the fact it reached a city higher above the level of the sea than the highest Alpine pass in Europe. The epidemic had almost ceased in Europe at this time, when it again broke out in June, 1833, on the coast of Portugal, where Lisbon was visited with especial severity. In North America, the northwestern march of the disease passed over 3,000 or 4,000 miles. The leap from Mexico to Portugal was somewhat after the manner as if it were about to return to its first point of departure, in an opposite direction to the first ellipse about the equator. In the winter of 1833, and in the year 1834, cholera prevailed in Portugal and Spain, in which countries the interior was first attacked, and afterward the coasts. In Madrid, Seville, and Bar-

celona it was especially severe. Spreading now eastwardly from the coasts of Spain, it attacked Cette, Marseilles, Toulon, Nice, and Genoa. From this place it entered Lombardy and Piedmont, attacking such places as Coni and Turin, finally reaching Leghorn, Florence, Trieste, etc. In 1835 it passed over from Spain into North Africa. A large part of the Mediterranean coast was attacked. None of the islands suffered but Malta, where one-fortieth of the population perished.

In the years 1836 and 1837 the disease prevailed again in Italy, especially in Naples and Rome. In 1836 Munich was also attacked, and South Bavaria and Tyrol severely. In the summer of 1837 it again entered Berlin, Breslau, and many places in East Germany. In October, 1837, it prevailed in Algiers over a pretty wide extent. With this year ended this great, almost world-wide epidemic, which in 1830 had manifested a renewed intensity. But in all these twenty years we observed, on the one hand, that it mostly extended in a north-westerly direction, and, on the other, that it was continually breaking out with renewed intensity at its centre and point of departure in the East Indies, when its extension would become still greater.

But this interruption in the prevalence of the disease did not last long, and perhaps even there was in reality no interruption. As early as the beginning of the fourth decade, we see the cholera again severe in India, especially along the courses of the Ganges and Sindh. From here it again reaches Kabul and Bokhara, and appeared as early as September, 1845, in Samarkand. In 1845 it prevailed severely in all Persia, spreading especially from the east to the west. Thus it traveled from Meshed to Teheran and Bagh-

dad. In Teheran, a city of 130,000 inhabitants, 7,000 are said to have perished. From Baghdad it traveled northwardly along the courses of the Tigris and Euphrates; we see it again passing southward to reach Basra. A great part of Arabia was next attacked. In Mecca and Medina it appeared again in November, 1846, and again caused extraordinary destruction among the assembled pilgrims. Up to this time the cholera had travelled from Meshed to Mecca, about 625 leagues, in ten months, or something like 55 leagues in a month. In the two last months of 1846 it traveled over a distance of 120 leagues, again overleaping the Caucasus to appear in Astrakhan. From this time on, it followed the course of the Volga, until it reached the north of Russia. In another line of extension it went out from the east towards the west, particularly along the Kur, penetrated Georgia, reached Trebizond, and on October 24th, 1847, broke out in Constantinople, which now became a chief centre of radiation. From Constantinople, all Syria and a large part of the countries about the Mediterranean Sea, were attacked. Roumania, also Wallachia and Bulgaria, were severely visited. To the north it again entered Russia, raging as a most violent epidemic, most especially in Moscow. Poland was now seized again, and the bordering provinces of Prussia, as well as Galicia, Bohemia, and Hungary, from another direction; then a large part of North Germany, especially Berlin, where it prevailed in 1848 with extraordinary intensity. Following the course of the Elbe, it again passed through Hamburg and from there over the sea to England, particularly to London, and thence to France. It broke out in Paris on March 11th, 1849, after it had previously appeared in a poor-house in St. Denis. I

happened to be at the Hotel-Dieu when the first patient was brought in, presenting already a perfect picture of cholera asphyxia. The disease lasted here up to the end of the year, a period of about nine months. At first it appeared slowly, attacking rather the poorer classes and debilitated persons; then it gradually seized upon all classes of people until it reached a hitherto unheard-of intensity, particularly during the first eight days of June. The number of dead daily numbered between 700 and 900. General terror was excited over the whole city. Hearses no longer sufficed to carry corpses to the cemeteries, and transport vehicles of all kinds, even artillery munition wagons, had to be impressed for service. At the same time the heat was oppressive, while the weather was clear and beautiful. The greatest contrast was exhibited between the profound desolation on the one hand and the extreme frivolity on the other; often while returning home at night or early morning, deeply depressed by scenes among the sick and dying, I would meet parties on the way, pale and reeling from the excess of their nightly orgies. On June 9th, a severe storm occurred, and from this day on the number of sick and dead markedly diminished, so that the fearful epidemic was almost forgotten during the political excitement which prevailed in the riot of June 13th. Still, lighter forms of the epidemic continued to recur quite frequently. Some 10,000 inhabitants in all fell victims to the disease. Many of the patients operated on in the hospitals died of cholera. In several localities the intensity of the disease was most strongly marked; that experienced in the Salpétrière, the hospital for aged females, was almost unknown in the past history of the epidemic. Of the 5,000 inhabitants of this great institution,

about 1,200 perished with cholera, and during the first three months this locality furnished almost one-fourth of the cases attacked, and one-third of the whole mortality. This local epidemic left far behind it that of Wall St., in Berlin, in 1848, which furnished only one-twentieth of all the fatal cases.

A large part of France was now attacked, and the disease prevailed in almost all Middle Europe in this year, during which it again reached America (towards the close of the year 1848), entering, not at the North as before, but at New Orleans, whence it spread in various directions.

This second great epidemic presented a somewhat similar course to the first, but with manifold differences in the details and modes of its dissemination. The ellipse of its whole course covered, in the same direction, a wider space. Yet there escaped, in their central parts, Savoy, a part of the mountains of Tyrol, and, to a considerable extent, the course of the Rhine, the Rhone, and the Isere, especially in their upper regions. Immunity from the disease was limited, however, to a much smaller number of places, as compared with previous epidemics; this was particularly the case with that of 1854.

This second epidemic passed almost without interruption into the next. Before the end of the year 1850 it showed itself again in Persia, but we do not know whether or not it reached that country again from India. In 1851 and 1852 it produced the greatest destruction in this part of Asia, extending, as had both preceding epidemics, to the southern range of the Caucasus. The regions of the Black and Caspian Seas, and the cities of Moscow and St. Petersburg, were now again attacked in succession. The territories of the Volga and Dnieper suffered

severely. Towards the end of the year 1852 and the beginning of 1853, Poland, the neighboring Prussian provinces, and later Berlin and Hamburg, were again attacked. To the north, the disease spread as far as Archangel. The Scandinavian countries were seized with great intensity. England and, later, France, were attacked in 1853, the latter especially in 1854 and 1855, over a wide extent. The coasts of the Mediterranean Sea, Marseilles, Genoa, and many other points, the Greek coast especially, were all seats of the disease. In South Germany, it prevailed in those countries in which it had manifested itself in 1836. In Munich and Augsburg it was especially severe.

The cholera now entered England again in 1853: but it was not until 1854 that it prevailed to a wide extent in England, Scotland, and Ireland. In 1853 and 1854 it extended over a considerable portion of the United States of America and the Antilles. In 1854 and 1855 it showed itself in Switzerland. Its spread and desolation during the Crimean war are well remembered. South America also, spared up to this time, was now severely visited in 1855, in Brazil.

It is most astonishing that the opinion should be generally accepted that Switzerland had escaped attack up to the year 1854; the fact is, the Canton of Tessin was long ago the seat of the disease. Cholera first appeared in Lugano and Mendrisio and their vicinities in July, 1836, having crept in from the province of Como; but it did not pass over Mont Cenis. Quite the same conditions prevailed in 1849, while in 1854 and 1855 Magadino, on Lake Maggiore, and Cadenazzo, places on the other side of the mountain were attacked. It is remarkable that while the disease was transported from Genoa to Tessin in

1854, nothing similar happened to the cholera fugitives who came into the valley of the Rhone over the Simplon pass, and the light Geneva epidemic, mentioned later, was carried over Mont Cenis. The Tessin epidemics lasted, on the average, about three months, but were never very marked. The first really great epidemic in Switzerland was that of 1854 in Aarau, where it first broke out in the poor-house and then rapidly spread over the city. It is probable that it was imported from Munich, where it was raging, as well as in Augsburg, in 1854, with great intensity. I observed a light local epidemic in Zürich in 1854; but the great epidemic did not occur until the following year, when the disease, having been imported, probably from Alsace, appeared in epidemic form during the spring in Basle, and also in the canton of Baselland. That portion of the city of Basle situated below the general level was especially attacked, while in Zürich, later, it was the higher regions of the city which were the chief seats of the disease. In both cities the epidemic lasted about ten weeks and in the country regions six weeks. A light local epidemic showed itself also in Geneva in August and September, 1855; it was probably imported from France and attacked in all but ninety-two persons. Among the greatest of the Swiss epidemics is that of 1867, which has been excellently described by Zehnder, and concerning which we are indebted to Biermer for some very valuable communications. Strange to say, a light, inconsequential epidemic appeared also in the village of Branson, opposite Martigny, in the Canton of Valais.

In later years cholera has broken out in many places in Middle and Northern Europe, and has become even epidemic in some cities, as Warsaw and

Königsberg, but never assumed the pandemic character which we observed in the first twenty-five years of the disease in Europe, and which we noticed for the last time in 1866, during the German-Austrian war, when almost more Prussian soldiers were killed by cholera than by battles. Breslau, a city so often visited by cholera, never had so murderous an epidemic as that of 1866, in which—aside from all the lighter cases, and those of cholerine—something like the twenty-fifth part of the whole population was attacked, and that with a mortality of over fifty per cent.

A retrospective view of the course of the disease up to the present time, teaches us that most the different parts of the earth's surface have been reached by the disease in its pandemic form, and that the islands, lands and countries hitherto exempt, such as for instance a part of the coast of West Africa, the Polynesian Archipelago, a part of North America, some of the northern countries of Europe – Lapland, Iceland, etc.—owe their immunity, partly to their comparatively isolation, and partly to accident. On the other hand, it is quite possible that favorable conditions of soil and drinking-water may oppose great obstacles to the development of cholera germs in different places. The constant escape of certain cities and regions during the last four decades, even in the midst of great destructive epidemics, is a strong argument in favor of this view.

[Thus Polish Lissa,, a great railroad junction, has always remained free from cholera; its water, which is of very good quality, is brought from outside the city through sound pipes; even imported cases have never extended the disease at this place.

Laubau is also supplied with pure spring water through iron pipes from without the city, and although a number of epidemics have occurred in the vicinity, it has always enjoyed immunity from cholera. The same is true of Pless, notwithstanding its marshy surroundings. Neumarkt, Groënberg and Glogaü owe their constant escape to the same cause. In the latter, the parts of the town supplied with pipes remained free from the epidemic even after cholera had been imported, while the part of the city on the right bank of the Oder, which is supplied with water from wells, lost one and one-half per cent of its population in the epidemic of 1866. The same is true also of Jauer, whose upper eastern portion, supplied with excellent wells sunk deep into the rock, escaped attack, while the western, low-lying parts, supplied by bad shallow wells, suffered much from the disease. Zobten, a town very near Breslau, likewise escaped; it is but poorly supplied with water, as many of the wells, only 20 or 30 feet deep, are bored out of the solid rock and dried up during the summer months. Tarnowitz, also, even after the importation of cases, has always remained free from cholera.—S.]

APPENDIX B.

Attention has been called to a publication of the Tennessee State Board of Health—a concise chronology of the various epidemics of cholera and their course,—which seems worthy of reproduction:

ASIATIC CHOLERA IN EUROPE AND AMERICA.

1629.—Bontius, a Dutch physician at Batavia, described the disease and first made it known to the medical profession in Europe.

1817.—It raged with great violence at Jessur (Bengal), India, whence it spread, not very swiftly, but with great certainty, in all directions.

1818.—By August it had reached Bombay*. Thence it traveled through Arabia, Persia, Mesopotamia, Syria, etc., on its westward course; and, continuing to extend itself eastwardly from its place of origin, invaded Burma, Siam, Java, Borneo, the Phillipines, China, and other populous countries of that portion of the globe.

1823.—It appeared at Orenburg and Astrakhan, Central Asia, and on the eastern frontier of Russia.

1828.—Remained here until this year, when it increased in violence, attacking a tenth of the inhabitants of the Province of Orenburg, proving fatal to a fourth of those affected.

1830.—Reappeared at Astrakhan. In less than a month 4,000 persons died of it in that city, and over 21,000 in the Province.

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* And the Northwest Province.—S.

1831, June 26th.—Appeared at St. Petersburg, having ascended the Volga and destroyed thousands in Moscow. From Astrakhan it also diverged along the northern coast of the Black Sea, and thence spread into Austria, Poland, Prussia and North Germany.

1831.—In August it was conveyed to Cairo by a caravan from Mecca. Over 15,000 died of it.

1831, October 26th.—It appeared for the first time in Sunderland, England, whence it spread slowly through the northern part of the island into Scotland.

1832, February 14th.—It broke out in London.

1832, June 8th.—The cholera broke out at Quebec, its first appearance in America. Two days afterward it was in Montreal.

1832, June 24th.—New York was attacked; thence it spread to Albany, Philadelphia, Cincinnati, New Orleans, etc. In New York it reached its height on July 21st.

1836.—It lingered in the United States for four years, and then entirely ceased. This first epidemic of cholera cost Great Britain and Ireland 40,000 lives out of 116,000 persons attacked. In the cities of Quebec, Montreal, New York, and Philadelphia, embracing then about 450,000 inhabitants, there were over 18,000 cases and 8,000 deaths. In India it remained endemic. Other Asiatic countries also suffered severely.

1846.—It appeared at Karatschi early this year, near the mouth of the Indus, with terrific violence. Thence to Teheran, capital of Persia, where its severity was such that 300 perished daily, for several weeks, in a population of not more than 60,000.

1847 and 1848.—Cholera ravaged parts of Russia and Turkey, having entered Europe by almost the

identical route as before. It traveled, however, with much greater rapidity.

1848.—In the autumn it appeared in France and Great Britain, revisiting during the next eight months, with almost unerring certainty, every place in which it had appeared in 1832–33, and seeking out the same filthy lanes and undrained sections of the cities where it had then committed its greatest ravages. It was even more malignant than in its previous visit. In England and Wales it carried off 53,293 persons.

1848, December 4th.—The barque *New York* from Havre, arrived at Staten Island, N. Y., with cholera among her passengers.

1849.—It occurred in New York. The whole number of cases reported outside the hospitals, in fifty-two days, was 2,631, of which 915 died. Also in New Orleans, and spread over the greater part of the Eastern and Western States.

1850.—In New Orleans, deaths from cholera, May to December, inclusive, 824. Cases occurred as late as February 15th, 1851.

1850.—At Cincinnati, from June 1st to August 15th, 1,400 deaths from cholera. At Columbus, Ohio, from July 24th to August 15th, 195 deaths from cholera—a great mortality for the population.

1851.—A second visitation at Cincinnati. Some 200 deaths, mainly in July.

1851.—From April to August, inclusive, 766 deaths from cholera in St. Louis. Total for the year, 847.

1852, May, June, and July.—Numerous cases in Cincinnati.

1852.—Total deaths in St. Louis for the year 789, of which 508 occurred in June and July.

1854.—Cholera as virulent in St. Louis as it was

in 1849. Total deaths 1,543, mainly in May, June, July, and August.

1855.—Disappeared from the United States.

1853, 1854.—Prevailed in Great Britain.

1855, 1856.—The allied armies in the Crimea suffered intensely.

1865–1874.—Cholera persisted in Europe about ten years.

1865.—In the beginning of May it broke out with terrible fury among the pilgrims at Mecca. On the tenth or eleventh of May the first death occurred at Alexandria. In June it had reached Cairo. On July 3rd, at Constantinople, where it produced a terrible panic. From Alexandria a steamer conveyed it to Marseilles. Thence travelers carried it to Paris.

1865, September.—Several cases in Southampton, England. Did not spread.

1865, November 3d.—Steamship *Atalanta* came into the lower bay of New York with 400 German immigrants, and cholera. Precautions taken; no spread.

1866, July 7th.—At Ancona in Italy, from Alexandria.

1865.—Great epidemic at Valencia, in Spain. Thirty-one out of forty-nine provinces in Spain were ravaged from July till the close of the year. It extended also into Portugal.

1866.—Cholera was early reproduced in almost all the localities it had visited in 1865. It extended northward as far as St. Petersburg. It appeared in several localities in Bavaria, Saxony, and Prussia, also in Belgium and Holland. It still existed in Paris and extended to the northwest of France.

1866.—An epidemic in Liverpool from July 22d, to the end of November carried off 1,792 victims. In

London for the three weeks ending August 4th, the deaths were 3,481, 1,097, 1,178. More or less diffused over England during the summer.

1866.—It broke out in New York about the beginning of May, and gradually spread over the country, following the lines of travel. Prevailed extensively in the United States Army, causing over 1,200 deaths among officers and men. During summer and fall prevailed extensively at New Orleans, and at St. Louis also.

1867.—A general abatement in Europe. Prevalent in South America. Buenos Ayres suffered greatly.

1867.—At New Orleans, reappeared in June; 571 deaths the following six months. Again at St. Louis during summer and fall.

1868.—Completely died out in Europe.

1869.—By its old route it reached Nijni-Novgorod, and broke out in September.

1870.—A vast outburst of cholera. In Russia, 9,386 deaths.

1871.—In Russia, 124,834 deaths.

1872.—In Russia, 113,196 deaths.

1873.—In Russia, 4,395 deaths.

1872.—Very widely diffused over Europe. Imported into England on several occasions. Its spread stopped by the local sanitary authorities.

1873.—Began to subside in Europe.

1872, December, and 1873, January. — There arrived at New Orleans a total of nearly two thousand immigrants from cholera-infected districts of Europe.

1873, February 9th.—First death at New Orleans. Two hundred and fifty-nine fatal cases occurred during the epidemic.

1873, April 8th.—First case, fatal, at Vicksburg.

1873, June 30th.—First case, fatal, at Little Rock. Four importations; no spread, owing to the energy and efficiency of the medical men in whose care the initial cases occurred.

1873, April 15th.—First case, fatal, at Memphis.

1873, May 24th.—First case, fatal, at Chicago. Total number of deaths from cholera and cholera morbus, May and September, 116. Many towns and villages suffered greatly.

1873.—First case at St. Louis, died May 11th. A mild epidemic followed. Other localities visited.

1873.—First case at Paducah, died May 21st. Very widely diffused throughout Kentucky.

1873, June 15th.—First death reported at Cincinnati. Two hundred and seven deaths during the summer. Other cities and towns in Ohio visited.

1873, June 6th.—First death at Evansville. Other localities in Indiana visited.

1873.—During June and July 62 deaths at Huntsville, Ala. Birmingham, with about three thousand inhabitants, was terribly scourged during June and July.

1873, June 15th.—First case, fatal, at Wheeling.

1873.—But two authenticated cases of cholera occurred in the State of Georgia. Both were residents of and refugees from Chattanooga. One died at Atlanta, population 22,000, on July 2d; the other, at Dalton, population 5,000, on July 3d. Both instances terminated fatally in communities in which the auxiliaries to the rapid development of a cholera epidemic were present, the specific causes once having been imported; yet in both instances, by the prompt and energetic action of the medical men having the cases in charge, the power of the disease was confined to the infected individual, and the health of

the residents of the respective houses and of each community was efficiently guarded.

1873.—During this year some two hundred cities and towns in the Mississippi valley were more or less afflicted.*

1882.—Made its appearance in Egypt, where, in three or four months it occasioned a mortality of 30,000 to 50,000 of the inhabitants.

1884.—On June 13th or 14th it invaded the French military post, Toulon. Then the cities of Toulon and Marseilles, and spread through the south and south-east of France, and partly in central and western France.

1885.—At Marseilles and Bretagne.

1884.—About August, in Spain.

1885.—Invaded almost the whole of Spain.

1884.—Brought into Italy.

1885.—Great ravages at Palermo, Sicily.

1885–6.—At Venice.

1886.—From April to the end of the year it ravaged the peninsula of Italy.

1886.—At Trieste, and also the Austro-Hungarian shores of the Adriatic.

1887.—Again in Sicily and in Italy.

1884–1887.—The epidemic of cholera in Europe cost France 15,000 inhabitants in 1884, 1885, and 1886; Spain, 180,000 inhabitants in 1884 and 1885; Austria-Hungary, 4,000 inhabitants in 1886; Italy, about 50,000 inhabitants in 1884, 1885, 1886, and 1887; Malta, 500 inhabitants in 1887—a sum approximately of 250,000 inhabitants of Europe. In other words, the epidemic has removed from France about one inhabitant for every 3,000, from Italy one inhabi-

* See "Public Health," vol. i, pp. 234-252.

tant for 550 or 600, from Spain one inhabitant for every 100, from Austria-Hungary one inhabitant for every 9,000. An approximate calculation of these losses, estimated from the purely material point of view, shows a sum total of about $80,000,000 of value destroyed. A still greater loss resulting from the damages caused by the disease through idleness, interference with commerce and navigation, interruption of business, etc., would increase the sum total of the losses occasioned by the cholera to about $200,000,000 in three or four years.*

1886.—Cholera introduced into the city of Buenos Ayres, and to the Argentine Republic, in November, by the ship *Perseo*, plying between that city and Genoa. A conspicuous instance of official pride and stupidity. An extensive epidemic developed, and the disease spread through the inland provinces. The city was cut off entirely from the commercial world; Banda Oriental, Brazil, Paraguay, and most of the European ports, quarantined against it.

1887, January 19th.—Cholera officially declared at Montevideo, Banda Oriental, after many denials of its existence.

1887, January 2d.—Cholera at San Felipe, a town situated at the base of the Andes, 40 miles north of Santiago. The latter city severely scourged. Commerce of Chili interrupted, with heavy losses.

1887, September 23d.—The steamship *Alesia* arrived at New York from Marseilles with cholera on board. At Naples some 600 emigrants from the cholera districts of Italy and Sicily were taken aboard. Proper precautions used by the quarantine

*See Report of E. O. Shakespeare, M.D., United States Commissioner.

officials, and the disease not allowed to spread. Much credit claimed, and justly, considering their limited means.

However, the case of the Italian steamship *Independenté*, which arrived at New York, in October, with a large number of immigrants, and, not showing cholera on board, was allowed to discharge her passengers after a few hours of detention necessary for a thorough inspection, shows the insufficiency of this New York safeguard. The next day numerous squads of these immigrants, with their baggage, departed for at least twelve great cities in widely distant parts of the country.

CHOLERA IN EUROPE IN 1892.

1892, June 27th.—At Baku, the Russian port on the Caspian, 48 new cases and 38 deaths. The town in a deplorably filthy condition and without the least pretense to sanitary arrangement.

June 30th.—Rome. Five cases have occurred in Italy.

July 1st.—The administration of the towns in the Asiatic provinces of Russia taking energetic measures to prevent its spread.

July 1st.—Many cases reported in the outskirts of Paris.

July 6th.—Saratov on the Volga scourged.

July 8th.—Panic in Astrakhan.

July 11th.—In Paris 14 deaths.

July 14th.—Terrible in Astrakhan.

July 17th to 21st.—Russian official returns announce 4,839 cases and 2,590 deaths for this period.

July 23d.—Advance toward the Russian frontier. Absorbs public attention in Berlin.

July 23d.—At Nijni-Novgorod and Moscow. Expected at St. Petersburg.

August 5th, 6th.—Cholera returns for all Russia these two days show a total of 6,741 new cases and 3,496 deaths. Prior to August 1st, total deaths, 23,919 (official).

August 1st to 12th.—In St. Petersburg 154 cases and 31 deaths between these dates officially admitted.

August 11th.—In Northern and Central Russia increasing. In Moscow many factories closed.

August 13th.—Returns for Russia this day show a large increase in new cases and mortality.

August 15th.—Total number of new cases reported in Russia, 7,600; deaths, 3,900. Two-thirds of the towns attacked can make no reports for lack of telegraphic connections.

APPENDIX C.

THE RECENT EPIDEMIC AT HAMBURG.

BY PRIVY COUNCILOR MAX VON PETTENKOFER.*

The outbreak of cholera in Hamburg in August, 1892, naturally excited all Germany. The alarm—which the explosive occurrence of the disease in the chief commercial city of Germany, hitherto regarded as the type of a rational drainage system—spread throughout Europe and beyond it, and was not less than that of sixty years ago when cholera first advanced into Russia from Asia. It is excusable that in 1892, as in 1831, physicians and governing bodies thought first of all how to prevent the further progress of the destroying angel—how to localize it at Hamburg.

The rigid regulations in force throughout Germany to insure this limitation, may be compared with the military cordons and others measures of detention and isolation in vogue sixty years ago. They are based on the belief that cholera is simply an infectious or contagious disease, passing from the sick and their excreta to the healthy; and that the virus can only be taken with the food, and especially in water. This is now by many deemed to be absolutely proved since Koch claimed the discovery of the comma bacillus. The strife against the bacillus is held to be the only real prophylaxis, to the ignoring of the great mass of

* Abstract of a paper contributed by Prof. Von Pettenkofer to the Munchener Medicinische Wochenscrift, Nov. 15th, 1892. Reproduced from the Scientific American Supplement.

epidemiological facts which are entirely opposed to the mere contagionist view of cholera. Many confine themselves to the behavior of comma bacilli in test-tube or on plate, and do not trouble themselves at all about the behavior of cholera in its epidemic extension. Many years ago I declared the ætiology of cholera appeared to me as an equation with three unknown quantities—*X*, *Y*, and *Z*. Let *X* be a specific germ disseminated by human intercourse; *Y* something which depends on place or time, the "local disposition;" and *Z* the individual disposition met with in all infectious diseases, both the directly infectious, as syphilis and small-pox, and others, as typhoid fever and malaria. The contagionists have eliminated the *Y*, finding a sufficient explanation in Koch's discovery of the *X*, and seeing in individual tendency or absence of immunity the factor *Z*; so that if *Z* be granted, cholera must occur should people introduce the bacilli into the mouth by unwashed hands, or take them into the stomach with water and food. The view is simple and easy, sufficient for him who only concerns himself with individnal cases, but it does not satisfy the epidemiologist; for the latter knows that there are not only cholera-immune people, but also cholera-immune places, and that even in places where cholera has prevailed there are seasons when it will not spread, although introduced. This is what I mean by the *Y*. It is not easy to define as is the *X*, and so far one can only say that it is related to the quality and dampness of soil.

Man alone of all living creatures is markedly susceptible to the cholera virus, and therefore experiments on animals with comma bacilli can determine nothing. The effects on the guinea-pigs—previously prepared by the administration of soda solution—of

an injection of a culture of bacilli, followed by one of laudanum, or the results of the intra-peritoneal injection of fresh cultures, are of no manifest importance as against the fact, confirmed a thousand times, that epidemics of cholera are never accompanied by epizoötics. Now and then it has been noted that cholera has coincided with undue fatality among cats or poultry, but the association in the main has been purely accidental. Guinea-pigs did not suffer during the late outbreak at Hamburg. Similar experiments on animals with non-pathogenic fungi—*e.g.*, the bacterium coli commune—are fatal, and the bacteria multiply in the body just like the comma bacilli. So that the only indisputable experiments on infection with comma bacilli are those made on man.

Now as Munich, in the year of grace 1892, in spite of much travel of persons from Hamburg and Paris, and in spite of its October fair, remained free from cholera, I did not scruple to experiment on myself with the comma bacillus. Of it I had received from Hamburg, through my colleague, Dr. Gaffky, a pure agar culture, and from this my junior colleagues, Drs. Pfeiffer and Eisenlohr, prepared a sufficient quantity of broth culture to be taken by the mouth. As Gruber found that fresh cultures acted on guinea-pigs more powerfully than cultures several days old, I employed a broth culture which had been in the incubator barely twenty-four hours. Fifteen minims of this was found to contain innumerable bacilli after being diluted a thousandfold, so that I could take at one dose many billions of bacilli, very many more than one could possibly introduce by unwashed hands. Since Koch states that comma bacilli are destroyed by the acid of the gastric juice, I was careful to take them on an empty stomach—viz., two hours and a

quarter after my "fruhstuck"—when, according to my friend, the physiologist Carl von Voit, there would not be more than three and a half ounces of gastric juice with 0.2 per cent. of hydrochloric acid in the stomach. To neutralize this free acid the broth culture of bacilli (fifteen minims) were taken in three and a half ounces of water, containing fifteen grains of bicarbonate of soda. The vessel was afterward rinsed with two ounces of water so as to insure my taking all the bacilli. I drank this cholera mixture in the presence of witnesses on Oct. 7th, it tasting like very pure water. Some were anxious about me, and begged I would allow them to sacrifice themselves for their old teacher, but I wished to act on the old medical principle, *fiat experimentum in corpore vili.* I was right in regarding myself as a *corpus vile.* I am seventy-four years old, have had glycosuria for years, have not a single tooth in my head, and only use my artificial teeth when I have to make a speech, not needing them for mastication; and I also feel other burdens of advancing age. Even if I had deceived myself, and the experiment had endangered my life, I should face death calmly, for it would not be as a thoughtless or cowardly suicide. I should die in the cause of science, like a soldier on the field of honor. Health and life, as I have often said, are very great earthly gifts, but not the highest. He who wishes to rank higher than the brute must be ready to sacrifice even life and health for great ideals. However, to me the matter did not seem quite so tragic, for I was firmly convinced my *X* could not kill without my *Y.*

[Professor Von Pettenkofer here gives a detailed account of his condition, *de die in diem*, as to tempera-

ture, pulse, sleep, food, intestinal symptoms, etc. On the 9th he began to have diarrhœa, and did not feel very well, having some abdominal discomfort; the diarrhœa increased on the 10th and continued up to the 14th. He took no medicine to control the diarrhœa, although advised to do so lest it should become chronic.]

The motions were examined bateriologically by Drs. Pfeiffer and Eisenlohr to trace the fate of the comma bacilli. The first loose motion contained a large quantity, and the subsequent watery stools contained pure cultures of the bacilli. On Oct. 14th, there were only a few isolated bacilli, and by the 16th these had disappeared. Bacteriologists generally admit that comma bacilli do not excite cholera by invading the body from the bowel, but that, remaining in the intestine, they give rise to the virus, which is absorbed, and then causes choleraic symptoms. Virchow more than twenty years ago pointed out the resemblance of cholera to acute arsenical poisoning. How great must have been the amount of poison formed by the many billions of comma bacilli during their eight days' sojourn in my intestine! But I did not suffer at all from poisoning, was quite well, retained my appetite, had no trace of nausea, no fall of temperature, no albumen in the urine, etc., and went about my daily avocations, so that I could only conclude that, although comma bacilli may cause diarrhœa, they can not cause cholera, either European or Asiatic. Possibly in Hamburg my experiment might have ended fatally, because there, on Oct. 7th, in addition to the Asiatic *X* there was plenty of the Hamburg *Y* present, and it might have been that a much smaller dose would have excited severe cholera.

[When this experiment had terminated, another was made in the person of Professor Emmerich, conducted on the same lines, except that he took a more restricted diet. A similar record is given of the daily condition in this case, the experiment commencing on October 17th. Early next morning there was one fluid motion, and in the course of the day diarrhœa set in, so that on the 19th to 20th there were fifteen to twenty colorless, watery evacuations; an enema containing tincture of thebaica was administered, and on the 20th one of tannic acid and opium. The motions became natural in the course of the 21st. Comma bacilli were found in the stools from October 18th to 28th, the motions on the 19th being almost pure cultures. On the 24th Professor Emmerich returned to his usual diet. Throughout his general condition was undisturbed, appetite retained, no pain in abdomen, and only some weakness from the diarrhœa. Apart from the diarrhœa he had some hoarseness of voice and dryness of pharynx.]

These two experiments on man show that the comma bacillus does not generate the virus of Asiatic cholera, thus confirming Bouchard's results of the different effects of injections into animals of pure cultures and of the excreta (stools and urine) from cholera patients. Choleraic symptoms were not induced by the former, but only by the latter. Bouchard's experiments also show that the special cholera poison is only formed in the human organism. Perhaps one should concede that Emmerich and I did have a mild attack of cholera, as Koch and his numerous sup-

porters would say, but I cannot admit the correctness of their view of the sufficiency of *X* and *Z* to cause an epidemic, to the exclusion of *Y*, no more than I can agree to the regulations enforced in Germany, Austrio-Hungary, and Italy, based on the discovery of the comma bacillus; and Dr. Baur and Dr. von Ziemssen, who have had large experience with cholera, affirm the symptoms we exhibited were not those of which they had experience in cholera epidemics. Yet according to the contagionist practice, on the discovery of comma bacilli in my evacuations I ought to have been ruthlessly confined in the isolation barracks of Munich and my dwellings thoroughly disinfected. It seems a pity that this did not take place, for if it had the contagionists would have been able to loudly proclaim they had saved Munich from cholera, since Emmerich and I, by our stools, which were discharged without disinfection into the closets and drains, might otherwise have certainly infected the town. Joking apart, I too would become a contagionist, so comforting and so sparing of all further trouble is the view, if it could only be explained to me why so many places into which cholera has repeatedly entered have never had an epidemic. Lyons, which stands on the direct line of traffic between Paris and Marseilles, two infected foci, is a striking instance. Koch's explanation of this from the practice of washing linen on boats in the fast flowing Rhone and Saone can hardly apply, since a like practice obtains at Zürich and Stuttgart, which do not enjoy such an immunity. The contagionists neither attack nor dispute the epidemiological facts which I have published on this head; they only ignore them, for they harmonize so little with contagionist theory.

Since 1831 Hamburg has been visited by cholera

fifteen times and Berlin twelve times (Table I). The traffic by land and water between the two cities is extremely intimate, giving every chance for the transference of comma bacilli.

TABLE I.—CHOLERA IN BERLIN.

Year.	Commenced.	Terminated.	Population.	Deaths.	Per 1000.
1831	Aug. 30	Jan. 26, 1832	229,843	1423	6.2
1832	June 17	Mar. 14, 1833	234,171	412	1.8
1837	Aug. 11	Dec. 6	265,394	2338	8.8
1848	July 27	" 9	400,557	1595	3.9
1849	May 30	" 11	401,802	3552	8.8
1850	Aug. 6	Nov. 24	405,707	711	1.8
1852	Sept. 4	Dec. 31	413,517	165	0.4
1853	Aug. 7	Nov. 30	415,425	940	2.3
1854	—	—	—	—	—
1855	July 26	Nov. 26	419,241	1385	3.3
1856	—	—	—	—	—
1857	—	—	—	—	—
1859	—	—	—	—	—
1866	June 14	Nov. 17	658,251	5457	8.3
1871	Aug. 14	" 3	826,341	55	0 07
1873	July 21	" 7	918,841	740	0.8

CHOLERA IN HAMBURG.

Year.	Commenced.	Terminated.	Population.	Deaths.	Per 1000.
1831	Oct. 31	Jan. 10, 1832	145,363	476	3 2
1832	Feb. 2	Dec. 17	146,365	1459	10.2
1837	—	—	—	—	—
1848	Sept. 1	Dec. 31	167,291	1674	10.0
1849	June 14	Nov 22	168,061	563	3.3
1850	July 26	Jan. 11, 1851	171,013	400	2.3
1852	—	—	—	—	—
1853	June 23	Oct. 29	182,534	244	1.3
1854	" 14	Nov. 14	284,274	281	1.5
1855	" 30	Oct. 22	185,641	175	0.9
1856	" 13	Nov. 14	187,896	67	0.3
1857	" 9	" 27	191,910	463	2.4
1859	" 9	Oct. 5	196,747	1109	5.6
1866	" 30	" 22	214,174	1093	5.1
1871	Aug. 1	Sept. 24	325,332	141	0.4
1873	June 14	Nov. 8	348,127	1001	2.9

The lack of correspondence as to time and severity of the outbreaks in the two places, is notable, especially in the years 1831, 1837, 1848, and 1849. Again, since 1831 neither of these towns has had a winter epidemic, whereas in Munich two of the three outbreaks during the same period have been in the winter—viz., 1836–37, 1873–74. The seasonal variations in cholera are well shown in the statistics compiled by Brauser from all cases occurring in the kingdom of Prussia from 1848 to 1859, the numbers being grouped in semi-monthly periods. He found that the minimum of cases and deaths fell in the first half of April, the totals being for these twelve years, 71 and 50 respectively; while in the first half of September they amounted to 57,395 cases and 31,048 deaths. Taking the half monthly minimum of deaths as unity, the rise and fall in the incidence of the disease, as gathered from the statistics, may be thus given (Table II):

Date.		Rlative mortality.	Date.		Relative mortality.
April	1–15	1.0	October	1–15	389.2
"	16–30	1.2	"	16–31	316 2
May	1–15	2.2	November	1–15	227.2
"	16–31	6.7	"	16–30	125.3
June	1–15	39.2	December	1–15	84.9
"	16–30	48 9	"	16–31	60.1
July	1–15	61 0	January	1–15	28.5
"	16–31	108.6	"	16–31	17.8
August	1–15	233.4	February	1–15	10.2
"	16–31	439.2	"	16–28	6.6
September	1–15	620.9	March	1–15	3.3
"	16–30	510.2	"	16–31	1.1

How is it possible to account for this enormous rise from 1 to 620, according to season, by the properties of the comma bacillus? Why does the bacillus act so powerfully in Hamburg and Berlin at one epidemic and so feebly at another? There must be a seasonal influence: What is it?

Some think it is due to *temperature*, but although

in Hamburg and Berlin epidemics generally begin in June and end in November, less often in October or December, yet there have been severe winter epidemics in Moscow, St. Petersburg, Munich, and elsewhere. In Calcutta, where it is endemic, the minimum of cholera is in August or September, the maximum from January to April, mostly April, and the mean temperature in Calcutta in April is 86.° Farh., of August 82.4° Farh.—*i.e.*, is nearly equal. But if the comma bacilli simply pass from man to man, season should have no influence, for the temperature of the intestine is constant at 98.5° Farh.—a tropical climate. There is, however, at Calcutta, another climatic factor—viz., the *rainfall*—which in April has a mean of 2.4 inches and in August of 14.6 inches, the annual average being 64 inches unequally distributed throughout the year.. The rains begin in May and cease at the end of September or October, the remaining months passing, perhaps, without a drop. Now the monthly mortality of cholera forms a curve exactly inverse to that formed by the rainfall. Rain can hardly affect bacteria, especially comma bacilli which flourish in moisture and are destroyed by dryness. In Prussia the same correspondence between rainfall and cholera holds, and perhaps the cause of the winter outbreaks at Munich may similarly be explained. The 1873 epidemic in Munich bears this out. It began suddenly in August, and as rapidly declined, so that very few cases occurred during October, although at this time there was much movement of the population (changing houses, opening schools, etc.). At the commencement of November it broke out again, and by December 4th it had reached a height of 56 cases daily, whereas in the whole of October there were only 21 cases reported.

Inexplicable from the bacillary contagionist view, it can be readily explained from the localist standpoint. The germ *X* was present in Munich long before the first case occurred. It is an epidemiological fact that cholera in certain places in India and beyond India may remain quiescent for months, and then break out again, while even longer periods of quiescence must be admitted for the outbreaks in Hamburg, Berlin, and Munich.

In the summer of 1868, at Bellinghausen, in Essen and elsewhere in the Prussian Rhine Provinces, and in Westphalia, there were cholera epidemics, but nowhere else in Europe; and unless its autochthonous origin be accepted, these outbreaks must be referred to the residues of the epidemic of 1866, which had been dormant in Essen. The great epidemic in Egypt in 1883 did not affect the Mediterranean ports that year. France saw in this the efficacy of quarantine, nevertheless in 1884 it broke out in that country. So in July and August, 1873, the local outbreak in Munich occurred after a very dry July, and was checked by an exceptionally wet August, but reappeared in the winter during another abnormally dry season.

It is remarkable that in Augsburg, which suffered so severely in 1854, and into which, in 1873, cases were introduced from Munich, no epidemic occurred in that year. This was not due to disinfection—it was before the discovery of the comma bacillus—but, more likely, to the excessive rains with which Augsburg was visited in 1873.

There is no doubt that like atmospheric conditions played a part in the epidemic at Hamburg in 1892. The summer had been exceptionally dry and hot; the heat in August was almost unbearable, being about 9° Farh. above the average, while the rainfall in

July, August, and September was considerably below the mean:

	1892.	Mean rainfall.
July.....	24 m.m.	99 m.m.
August.....	53 "	77 "
September.....	46 "	64 "
	120 m.m.	238 m.m.

Naturally also the level of the subsoil water was lowered. The temperature of the Elbe, which is taken in mid-stream every morning, rose in August to 71.6° Farh. Yet similar conditions of weather prevailed in other parts of North Germany, which were also susceptible to cholera, but where it has not yet become epidemic, and where possibly epidemics may break out later. As regards the rainfall, only those places can be compared where observations have been continuous, for, as at Munich and Augsburg, neighboring districts, where the average rainfall is the same, may differ very widely in particular years and seasons. The cholera germ from Russia has been more widely disseminated this year (1892) in France than in Germany, and that it only found a favorable soil in Hamburg must be due to a special reason.

Hamburg for years has been making a special hygienic experiment on the largest scale, for it thinks it can be cleansed by using an extremely impure water. The Hamburg water works distribute unfiltered Elbe water throughout the town and suburbs. In the mains are found dense layers of fungi of vegetable and animal origin; here and there a tap is plugged by the head of an eel. For drinking purposes the water may be filtered at home, or if this does not suffice, thirst may be quenched by wine, beer, seltzer, etc. For all domestic uses, for cleans-

ing rooms and dwellings, courts and streets, the unfiltered Elbe water is alone used, and then, owing to the excellent drainage into the Elbe, part of the refuse of the city must actually flow back into the water mains, thus rendering nugatory the sanitary aim of the drainage system. Above the reservoir the Elbe furnishes a purified water; but it becomes so contaminated on passing through Hamburg that within this area it cannot undergo self-purification. To be serviceable for consumption or domestic use its water should be further purified, as by filtration through sand, as is done at Altona, a few kilometers below Hamburg. At Cuxhaven the Elbe again becomes free from Hamburg impurities. It is plain also that the same degree of contamination may act differently on different soils, and all epidemics of cholera in Hamburg have shown essential differences between quarters situated upon marshy land and upon high ground.

Reincke has shown that since the introduction of a drainage system into Hamburg the frequency of typhoid fever has diminished, except for some variations in abnormally dry seasons. Epidemics of typhoid fever have this in common with cholera; but that Hamburg, in spite of its excellent drainage, may still be a fruitful soil for typhoid is shown by the epidemics of that disease during 1885 to 1887, while in 1892, associated with cholera, there was a notable increase in typhoid fever.

We are more fortunate in Munich, for formerly, with very good drinking water but high level of subsoil water, we often had more than twenty deaths annually from typhoid fever among 10,000 inhabitants. However, since 1881, with subsoil water at a very low level, the deaths have not exceeded one. The once

notorious typhoid soil of Munich has been gradually purified by sanitation, and we regard with some confidence any fresh visitation of cholera. In Hamburg itself a system of sand filtration was commenced until the cholera intervened, but the new water works are expected to be completed in the autumn of 1893. These works, on a gigantic scale, are under the direction of Engineer-in-Chief A. Meyer, and will cost many millions of marks, but not so much as Hamburg has lost by the cholera of 1892.

The part played by water in this epidemic has been variously explained. The "drinking water theorists" think that comma bacilli from Russian Jews found their way from the Elbe to the reservoirs, and were thus distributed throughout the town—a most plausible and comfortable explanation for the laity and the profession. Still experience does not always fit in with this theory, for outbreaks quite as "explosive" have occurred without the drinking water being at fault. I leave it undetermined whether in 1892 the Hamburg water operated directly as drinking water or indirectly as foul usable water. It is strange that in spite of the most careful search they should have had the misfortune not to find any comma bacilli in the Elbe water or in the water from the Hamburg mains. This is said to prove nothing, since other bacteria may be present which fluidify nutrient gelatin. Yet Koch found his bacilli in a Calcutta tank, and Fraenkel in the water of the Rhine where lay a boat containing a case of cholera. The water of the Indian ponds is not only drunk, but used for bathing and washing. The comma bacilli escaping from the human intestine into river or pool must be overcome by other bacteria and disappear very rapidly. I am not asserting that the comma bacillus

has no ætiological importance, but I believe it impossible for it to be the *X* which can excite and develop cholera epidemics apart from the *Y*. And if we have found a specific micro-organism in an infectious disease, we ought to hope that some means may be found thereby to combat the disease. Tuberculosis is a striking example. The discovery of the tubercle bacillus in the sputa of phthisical patients was scientifically as interesting and important as that of the comma bacillus in choleraic evacuations. But since the discovery of the tubercle bacillus, which is older than that of the comma bacillus, neither more or less people have died from phthisis than formerly.

The present protective measures against cholera rest entirely on purely theoretical contagionist bases. We have become very one-sided, thinking that cholera must be met by prevailing theories and not that theory should follow after cholera. It is deemed most important to seize the comma bacillus from the first case occurring in a place, and when its presence is proved to isolate the patient, and disinfect his excreta and his dwelling; and then the village or town is supposed to be protected from cholera. If in Hamburg the first case had been isolated and disinfected, the epidemic, so people think here, could not have broken out. Until a case comes to official knowledge it is in contact with others and the evacuations are not disinfected; and when reported, it must be determined bacteriologically whether it is a case of Asiatic cholera or one of cholera nostras. Then the source of infection must be traced, and often the disease breaks out in many parts simultaneously, as it did in Hamburg, adding to the difficulty of the task. Nothing but absolute stoppage of all traffic could avail, and that would be a greater misfortune than the

cholera. The spread of the cholera germ is not to be prevented, either in India or elsewhere, by isolation, disinfection, cordons, quarantines, etc. Just as, in spite of customs houses, goods are still smuggled over the frontier, so bacteria and viruses will be smuggled through all barriers. Still, improved sanitation may do much to prevent the smuggled germs gaining a foothold. In the sixties, when Prussia, Belgium, Holland, and France had most severe epidemics, Great Britain was only moderately invaded, and since 1866, in spite of its colossal traffic with the motherland of cholera, and the introduction of numerous cases from other lands, England has not had a single local epidemic, neither during the cholera time on the Continent from 1871 to 1874, nor during 1884 to 1887. Even this year (1892) cholera has not invaded Great Britain from Hamburg, Russia, and France, although England (London) was the only land which fearlessly trafficked with ships coming from infected ports.

If one cannot act against the introduction of the germ *X*, one must seek to act in the direction of *Y* and *Z*, and strive to make places or people immune. Every epidemic shows that many do not possess the *Z*, the individual disposition, and that they are immune. Some are protected by their own serum, perhaps, and it may be possible to ward off cholera, like variola, by protective inoculation. The contagium of variola was not mastered by isolation and disinfection until vaccination proved successful. Cholera is not contagious like variola, but depends on local conditions, and susceptible places may be rendered immune, like Fort William in Calcutta. There have been in other places as severe epidemics as this in Hamburg, but where all these measures of isolation, etc., were not in

vogue, and where the disease arose and subsided as quickly as it did at Hamburg.

[Professor von Pettenkofer here contrasts the epidemic at Munich of 1854 with the Hamburg outbreak. He goes on to contend that neither military cordons as in Russia, quarantines, or the forbidding of fairs, etc., have any influence; and he expresses the fear that in 1893, if there is a lack of rain, cholera may overrun Germany.]

The contagionists say that when cholera breaks out in a place, the rules demanded by their theory should be enforced. I am convinced that this is a mistake. I know of cases where nothing of this sort has been done, and the epidemic has been remarkably mild, much milder than where the contagionist practice has been carried into effect.

[In proof of this Professor von Pettenkofer cites at some detail the outbreak of cholera in Bavaria in 1836, and shows that the authorities acted on the anti-contagion plan, only transferring those cases to hospital which could not be cared for at home, and not interfering with public meetings and feasts. At that time Munich was in an unsanitary state, yet the epidemic was the mildest of the three it has experienced. There was no dread of cholera in those days. Nothing was known of bacteria; and cholera was attributed not to comma bacilli, but to the genus epidemicus. Traffic in and out of Munich was not deranged.

He concludes by expressing the hope that the

recent appearance of cholera in Europe will not lead to restrictive regulations based on merely theoretical grounds, so greatly hampering free intercourse, and even contrary to humanity, without any practical effect, and that the money expended on them will be devoted to attainable sanitary aims. Reflecting how many millions must have been thus sacrificed to theory in a single town like Hamburg, it is inconceivable, he remarks, "how opposition can be made to the new military bill before the Reichstag, which is based on much sounder grounds than the contagionist rules against cholera. I live and die in the conviction that our army will subdue enemies who would invade us from the east or the west, but *not* that our capture of bacilli, our cholera barracks, isolations, disinfections, prohibitions of entry and transit, or our quarantines, can prevent the invasion and dissemination of cholera."]

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